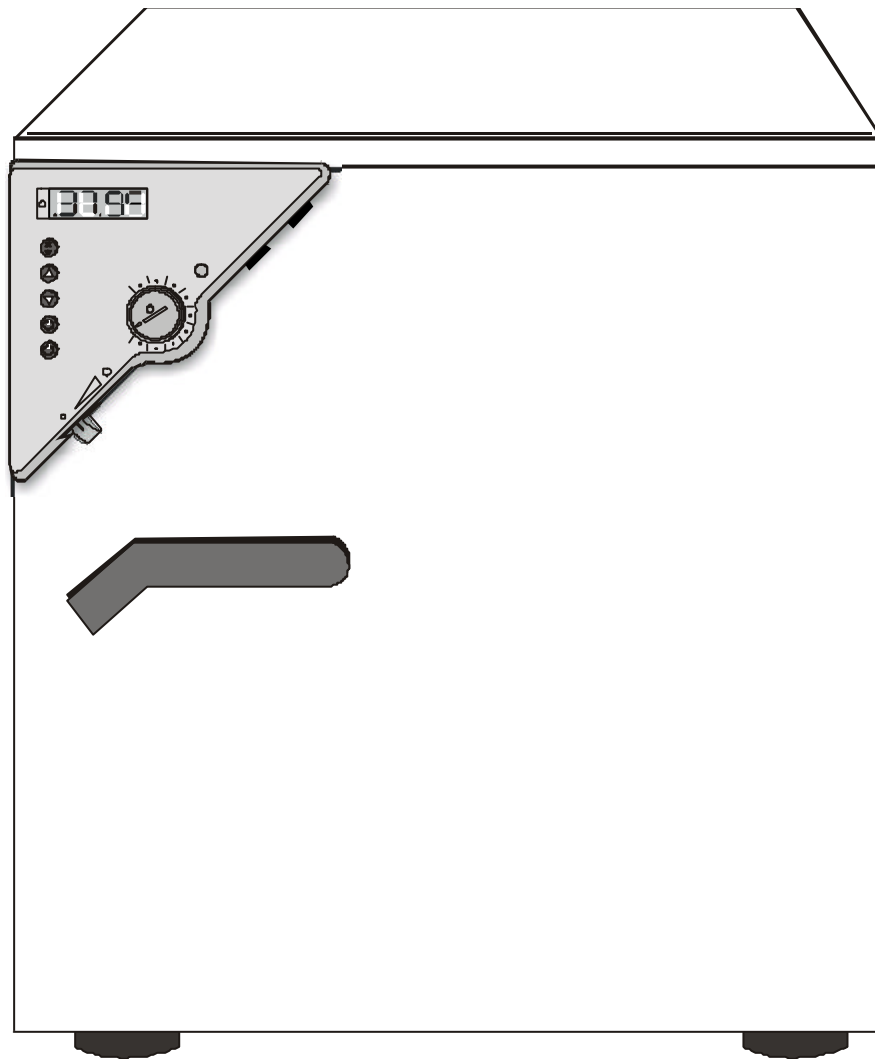


BD/ED/FD (E2)

Service Manual



Version of chamber described in this service manual:

Standard equipped BD, ED, FD
with
R3 Controller

Contents

1	Chamber Description.....	3
1.1	BD (E2).....	3
1.2	ED (E2).....	3
1.3	FD (E2).....	3
1.4	Description of the Chamber BD, ED and FD	3
2	Function.....	4
2.1	BD (E2).....	4
2.2	Flow Chart of the Heating System of a BD (E2) (Standard BD 115 (E2)).....	4
2.3	ED (E2).....	5
2.4	Flow Chart of the Heating System of a ED (E2) (Standard ED 115 (E2)).....	5
2.5	FD (E2).....	6
2.6	Flow Chart of the Heating System of a FD (E2) (Standard FD 115 (E2)).....	6
2.7	PT100 Temperature Probe Resistance/Temperature Table.....	7
2.8	Description of the R3 controller Inputs and Outputs.....	7
3	Trouble Shooting.....	8
3.1	BD Chamber	8
3.2	ED Chamber	8
3.3	FD Chamber.....	9
3.4	APT-COM at BD, ED and FD.....	9
4	Most common service works.....	10
4.1	Changing of the controller R3.....	10
4.2	Changing of the fan at FD (E2) chamber	11
4.3	Calibration Procedure "One Point Calibration".....	13
4.4	Change Display from °C (Celsius) to °F (Fahrenheit).....	15
4.5	Activation or deactivation of 0.1 steps at the temperature display.....	16
5	BD, ED and FD connected to APT-COM.....	18
5.1	Communication Software APT-COM.....	18
5.2	Settings at the controller R3	18
5.3	Connection of one chamber BD, ED or FD	19

1 Chamber Description

1.1 BD (E2)

The BD (E2) chamber was developed for microbiology. The chamber is equipped with a R3 controller and as an Option available with a RS422 Interface. The highest achievable temperature is 100°C.

The BD (E2) Chamber is available in the sizes 53, 115, 240, 400 and 720.

1.2 ED (E2)

The ED (E2) chamber was developed for drying and hot air sterilizing with natural convection. The chamber is equipped with a R3 controller and as an Option available with RS422 Interface. The highest achievable temperature is 300°C.

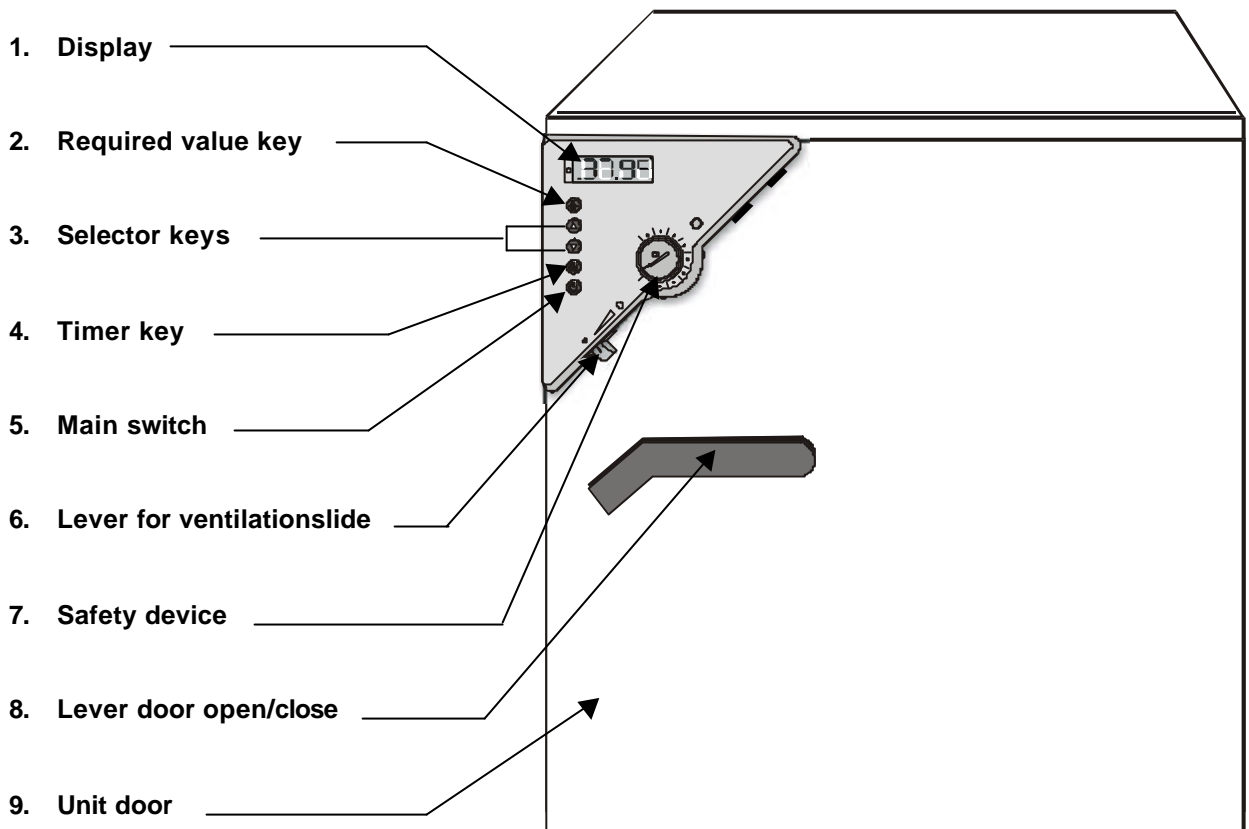
The ED (E2) Chamber is available in the sizes 53, 115, 240, 400 and 720.

1.3 FD (E2)

The FD (E2) chambers was developed for drying and hot air sterilizing with forced convection. The chamber is equipped with a R3 controller and as an Option available with RS422 Interface. The highest achievable temperature is 300°C.

The FD (E2) Chamber is available in the sizes 53, 115, 240, 400 and 720.

1.4 Description of the Chamber BD, ED and FD



Picture 1: Heating Oven with R3-Controller

2 Function

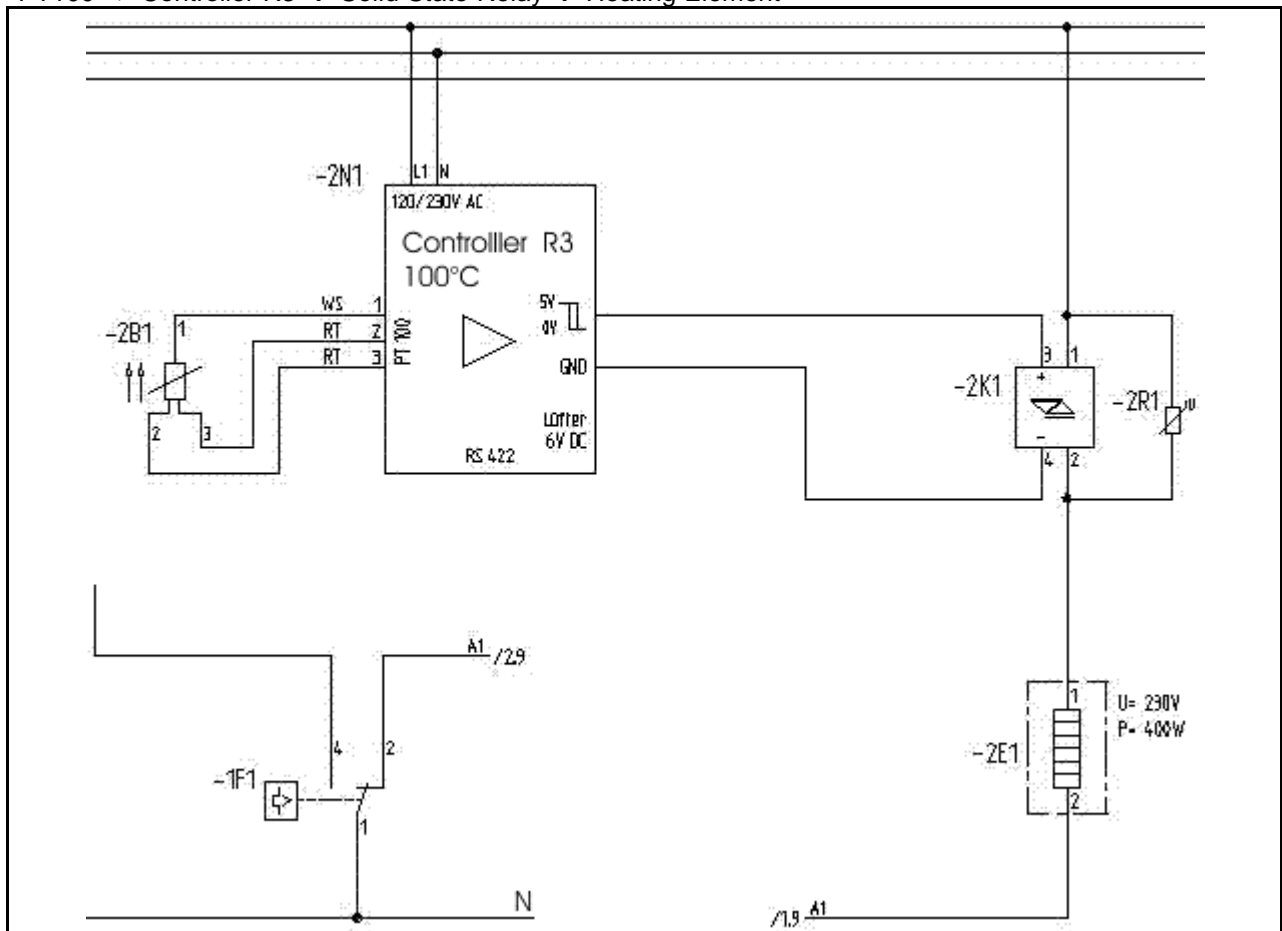
2.1 BD (E2)

The BD (E2) chamber gives the possibility to heat up the chamber to a maximum temperature of 100°C. The measuring of the temperature will be realized by a PT100 temperature probe which is placed directly in the inner of the chamber .

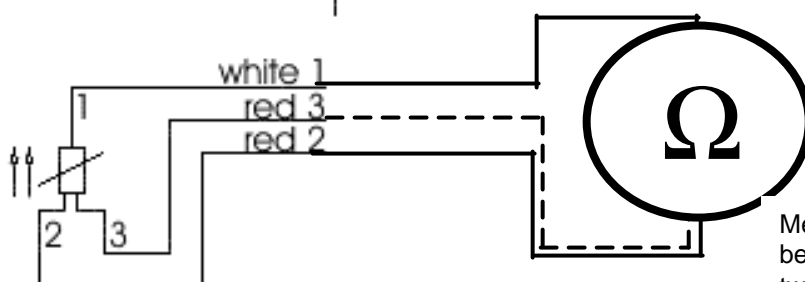
The controller R3 measures the resistance of the PT100 temperature probe and compares the incoming signal with the actual engaged value and decides to give a Signal to activate the heating elements or not.

2.2 Flow Chart of the Heating System of a BD (E2) (Standard BD 115 (E2))

PT100 → Controller R3 → Solid State Relay → Heating Element



The PT100 temperature probe is a resistance-measurement system. This means that the PT100 changes his resistance at different temperatures. For example: at 37°C, the resistance of the PT100 have to be 114,380 Ω. To measure the resistance, disconnect all three cables from the controller and measure between the white cable and one of the red cables, don't measure between both red cables.



Measuring of the PT100 resistance between the white cable 1 and one of the two red cables 2 or 3

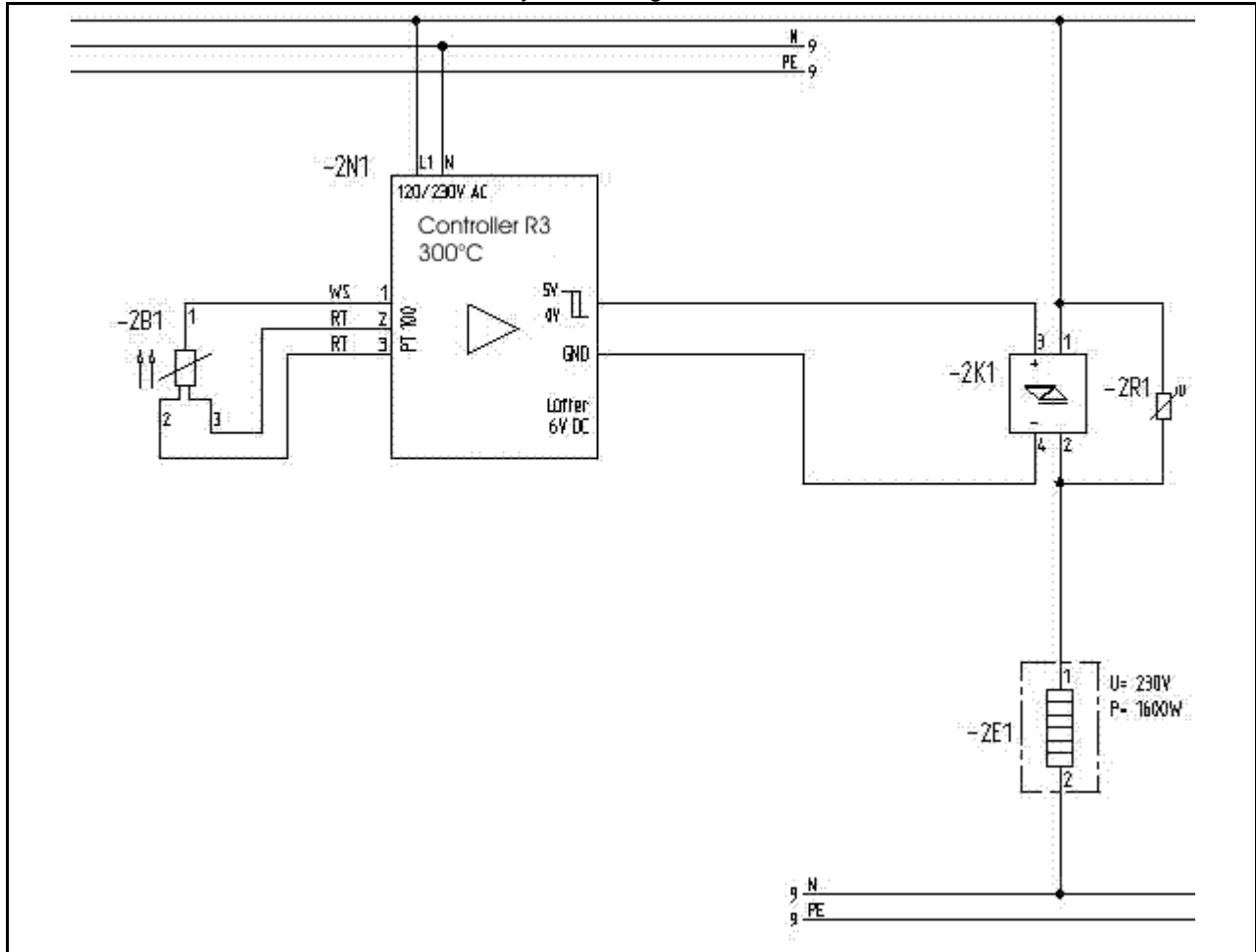
2.3 ED (E2)

The ED (E2) chamber gives the possibility to heat up the chamber to a maximum temperature of 300°C. The measuring of the temperature will be realized by a PT100 temperature probe which is placed directly in the inner of the chamber .

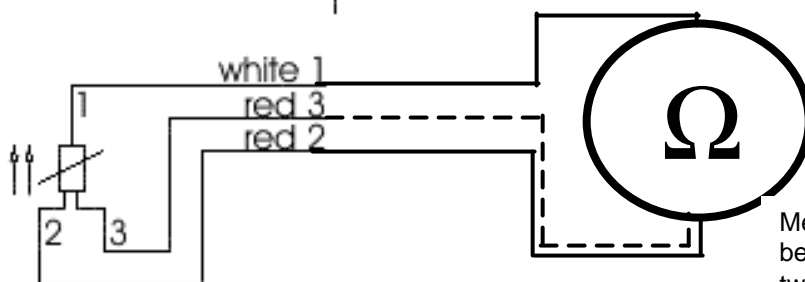
The controller R3 measures the resistance of the PT100 temperature probe and compares the incoming signal with the actual engaged value and decides to give a Signal to activate the heating elements or not.

2.4 Flow Chart of the Heating System of a ED (E2) (Standard ED 115 (E2))

PT100 → Controller R3 → Solid State Relay → Heating Element



The PT100 temperature probe is a resistance-measurement system. This means that the PT100 changes his resistance at different temperatures. For example: at 37°C, the resistance of the PT100 have to be 114,380 Ω. To measure the resistance, disconnect all three cables from the controller and measure between the white cable and one of the red cables, don't measure between both red cables.



Measuring of the PT100 resistance between the white cable 1 and one of the two red cables 2 or 3

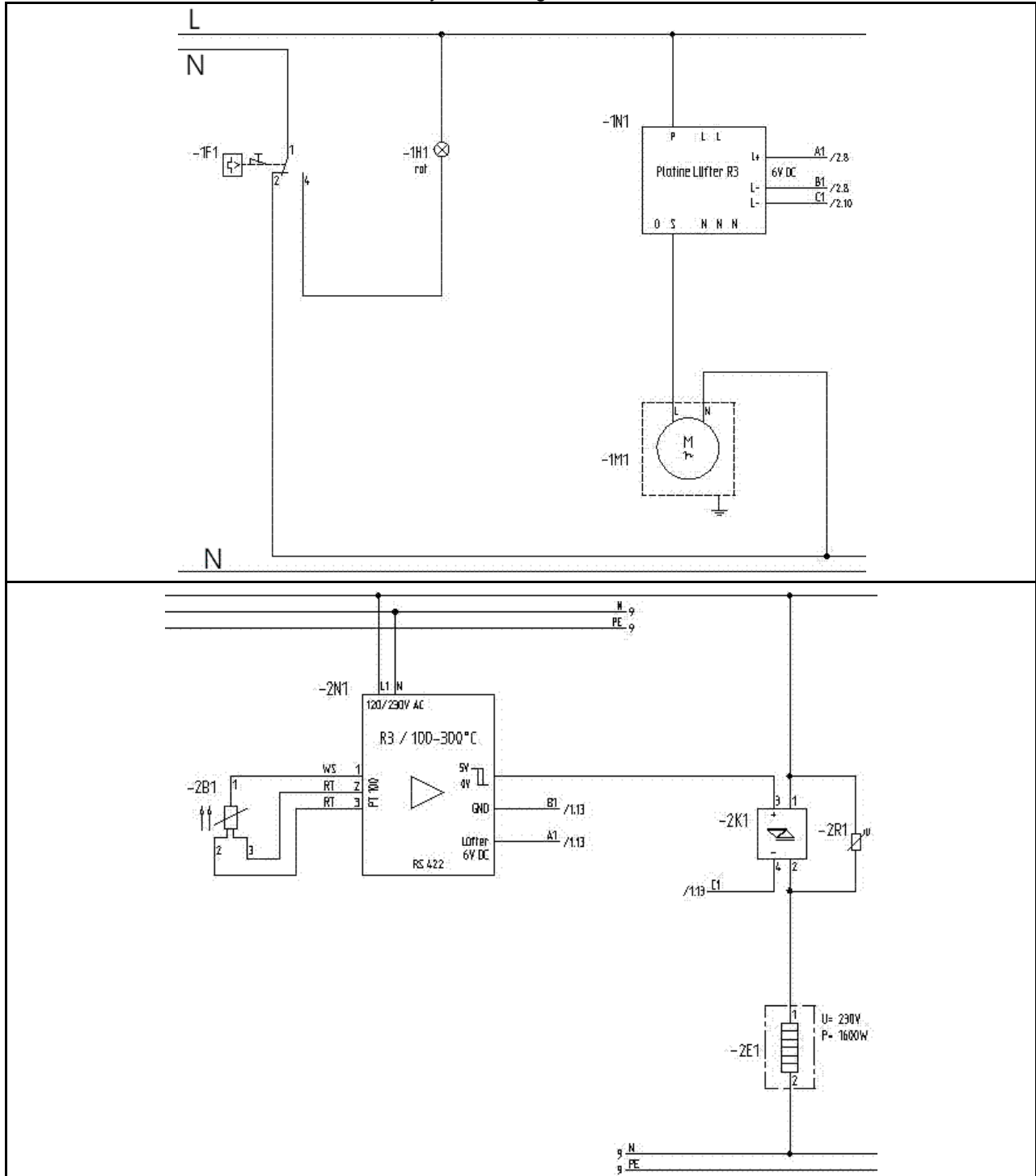
2.5 FD (E2)

The FD (E2) chamber gives the possibility to heat up the chamber to a maximum temperature of 300°C. The measuring of the temperature will be realized by a PT100 temperature probe which is placed directly in the inner of the chamber .

The controller R3 measures the resistance of the PT100 temperature probe and compares the incoming signal with the actual engaged value and decides to give a Signal to activate the heating elements or not.

2.6 Flow Chart of the Heating System of a FD (E2) (Standard FD 115 (E2))

PT100 → Controller R3 → Solid State Relay → Heating Element

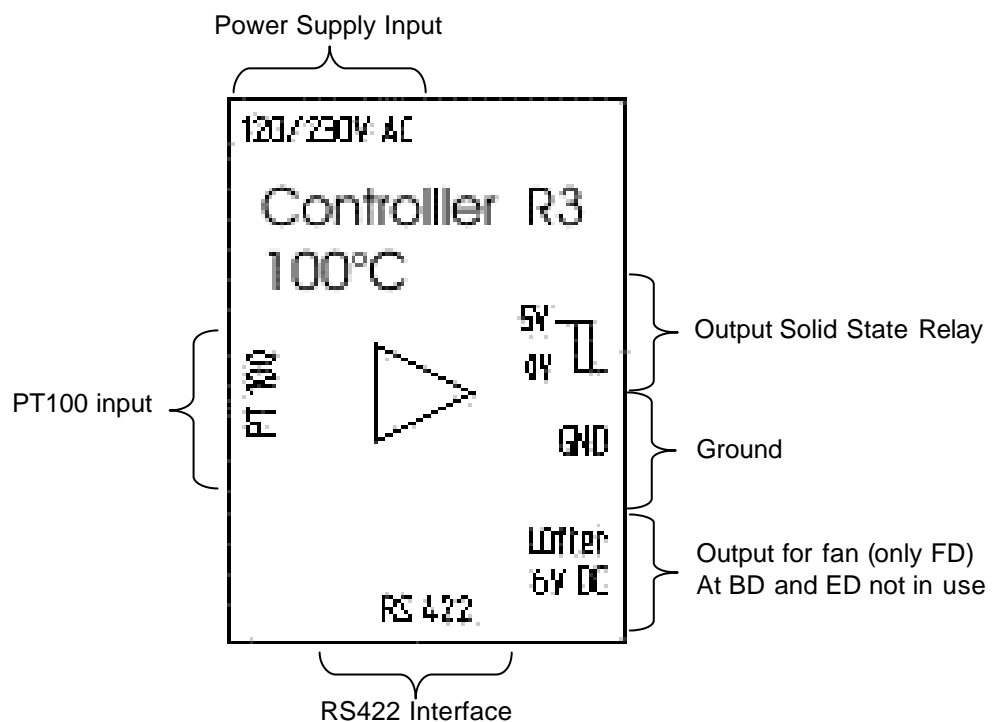


2.7 PT100 Temperature Probe Resistance/Temperature Table

T (°C)	0	1	2	3	4	5	6	7	8	9	10
-10	96,086	96,478	96,870	97,262	97,653	98,045	98,436	98,827	99,218	99,609	100,000
0	100,000	100,391	100,781	101,172	101,562	101,953	102,343	102,733	103,123	103,513	103,902
10	103,902	104,292	104,681	105,071	105,460	105,849	106,238	106,627	107,016	107,404	107,793
20	107,793	108,181	108,570	108,958	109,346	109,734	110,122	110,509	110,897	111,284	111,672
30	111,672	112,059	112,446	112,833	113,220	113,607	113,994	114,380	114,767	115,153	115,539
40	115,539	115,925	116,311	116,697	117,083	117,469	117,854	118,240	118,625	119,010	119,395
50	119,395	119,780	120,165	120,550	120,934	121,319	121,703	122,087	122,471	122,855	123,239
60	123,239	123,623	124,007	124,390	124,774	125,157	125,540	125,923	126,306	126,689	127,072
70	127,072	127,454	127,837	128,219	128,602	128,984	129,366	129,748	130,130	130,511	130,893
80	130,893	131,274	131,656	132,037	132,418	132,799	133,180	133,561	133,941	134,322	134,702
90	134,702	135,083	135,463	135,843	136,223	136,603	136,982	137,362	137,741	138,121	138,500
100	138,500	138,879	139,258	139,637	140,016	140,395	140,773	141,152	141,530	141,908	142,286

For Example: Your resistance measurement system shows you 114,380 Ω this corresponds to 37°C.

2.8 Description of the R3 controller Inputs and Outputs



3 Trouble Shooting

3.1 BD Chamber

Fault Description	Fault Cause
Not possible to reach the temperature within the specification time	<ul style="list-style-type: none"> The door doesn't close completely. The door sealing is broken or damaged The controller need a calibration
The chamber heats over the temperature setting	<ul style="list-style-type: none"> The solid state relay could be defect The controller could be defect The PT100 could be defect The controller need a calibration
The chamber doesn't heat any time, the indicator light doesn't lights up	<ul style="list-style-type: none"> The safety device has switched off the chamber Timer off The controller is defect
The chamber doesn't heat any time, the indicator light lights up	<ul style="list-style-type: none"> The solid state relay is defect The Heating element(s) is/are defect
The glass door of the chamber doesn't close.	<ul style="list-style-type: none"> The plastic catcher is defect
The chamber doesn't do anything	<ul style="list-style-type: none"> Check if the power supply cable is connected to the mains Check if the mains has 115V or 230V voltage
The chamber doesn't do anything, only the green LED lights	<ul style="list-style-type: none"> The chamber is in Stand-by mode
No data transfer to and from the APT-Com possible. The installation is correctly. (At BD with Interface)	<ul style="list-style-type: none"> Wrong chamber address is set at the controller

3.2 ED Chamber


Fault Description	Fault Cause
Not possible to reach the temperature within the specification time	<ul style="list-style-type: none"> The door doesn't close completely. The door sealing is broken or damaged The controller need a calibration
The chamber heats over the temperature setting	<ul style="list-style-type: none"> The solid state relay could be defect The controller could be defect The PT100 could be defect The controller need a calibration
The chamber doesn't heat any time, the indicator light doesn't lights up	<ul style="list-style-type: none"> The safety device has switched off the chamber Timer off The controller is defect
The chamber doesn't heat any time, the indicator light lights up	<ul style="list-style-type: none"> The solid state relay is defect The Heating element(s) is/are defect
The glass door of the chamber doesn't close.	<ul style="list-style-type: none"> The plastic catcher is defect
The chamber doesn't do anything	<ul style="list-style-type: none"> Check if the power supply cable is connected to the mains Check if the mains has 115V or 230V voltage
The chamber doesn't do anything, only the green LED lights	<ul style="list-style-type: none"> The chamber is in Stand-by mode
No data transfer to and from the APT-Com possible. The installation is correctly. (At ED with Interface)	<ul style="list-style-type: none"> Wrong chamber address is set at the controller

3.3 FD Chamber

Fault Description	Fault Cause
Not possible to reach the temperature within the specification time	<ul style="list-style-type: none"> The door doesn't close completely. The fan doesn't work The door sealing is broken or damaged The controller need a calibration
The chamber heats over the temperature setting	<ul style="list-style-type: none"> The solid state relay could be defect The controller could be defect The PT100 could be defect The controller need a calibration
The chamber doesn't heat any time, the indicator light doesn't lights up	<ul style="list-style-type: none"> The safety device has switched off the chamber Timer off The controller is defect
The chamber doesn't heat any time, the indicator light lights up	<ul style="list-style-type: none"> The solid state relay is defect The Heating element(s) is/are defect
The glass door of the chamber doesn't close.	<ul style="list-style-type: none"> The plastic catcher is defect
The chamber doesn't do anything	<ul style="list-style-type: none"> Check if the power supply cable is connected to the mains Check if the mains has 115V or 230V voltage
The chamber doesn't do anything, only the green LED lights	<ul style="list-style-type: none"> The chamber is in Stand-by mode
No data transfer to and from the APT-Com possible. The installation is correctly. (At FD with Interface)	<ul style="list-style-type: none"> Wrong chamber address is set at the controller

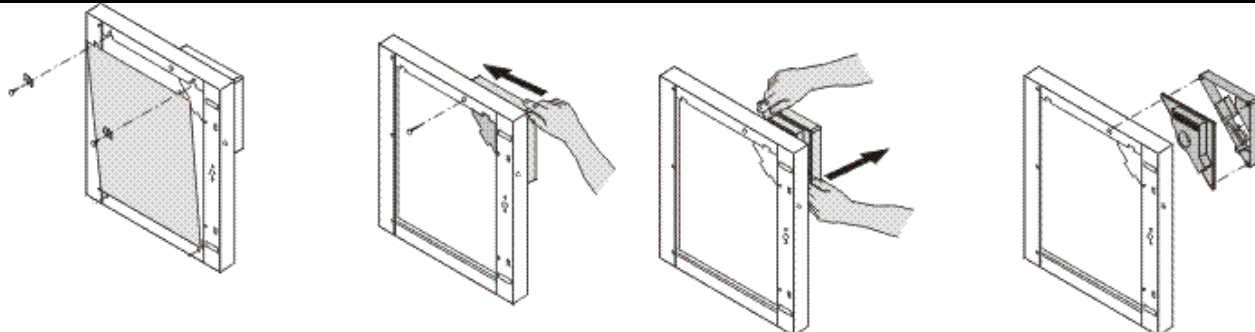
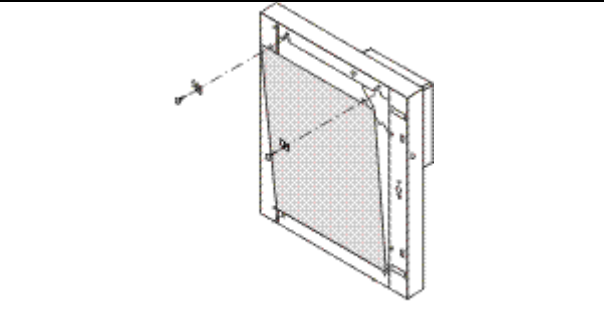
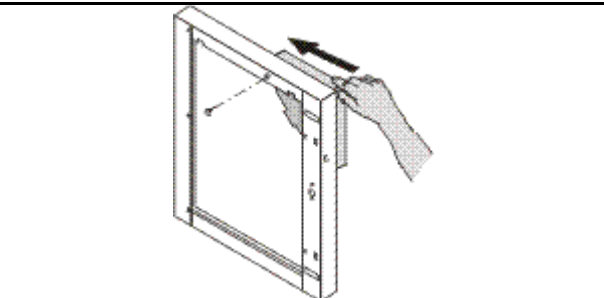
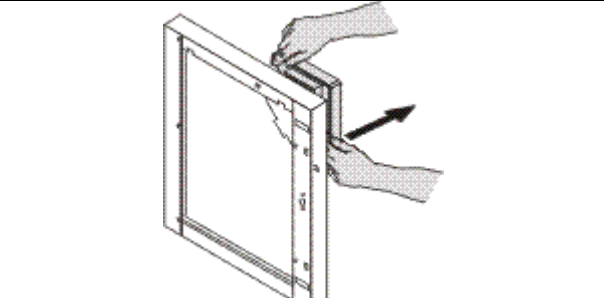
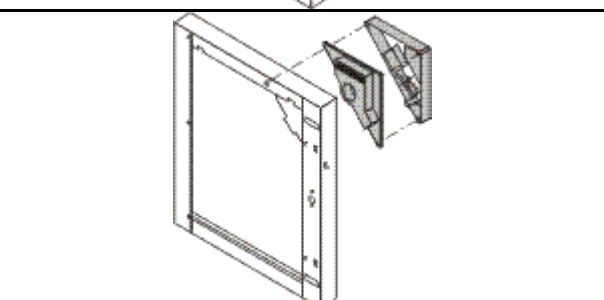
3.4 APT-COM at BD, ED and FD

Fault Description	Fault Cause
No Function	<ul style="list-style-type: none"> Connection is wrong, check the connection like described in Chapter 5 APT-COM Connection Address in the controller is wrong Controller is in Stand-By mode
No data transfer to and from the APT-Com possible. The installation is correctly.	<ul style="list-style-type: none"> Wrong chamber address is set at the controller The connection cable is broken/defect The Switch at the converter is set to DCE (correct = DTE) The converter doesn't get the needed current

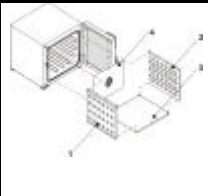
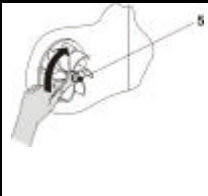
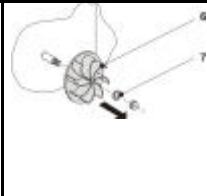
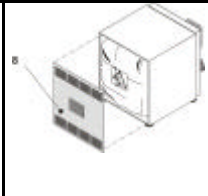
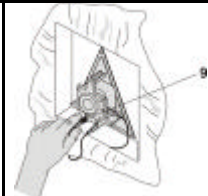
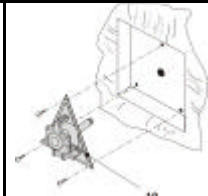
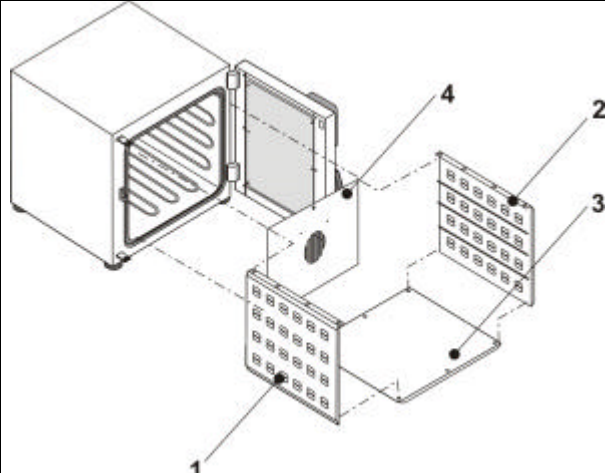
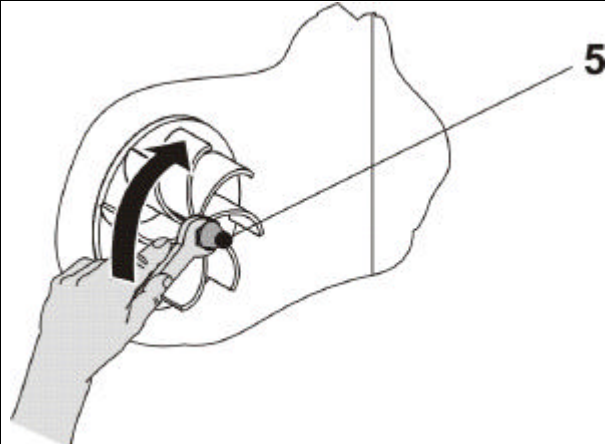
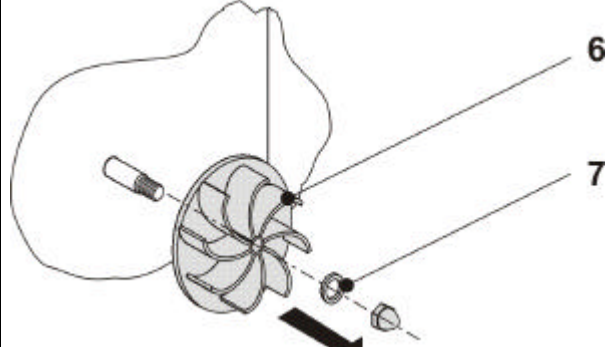
BD/ED/FD (E2) Service Manual	
State: 01/2002	Created: 06/2002 / Jochen Tussinger

4 Most common service works

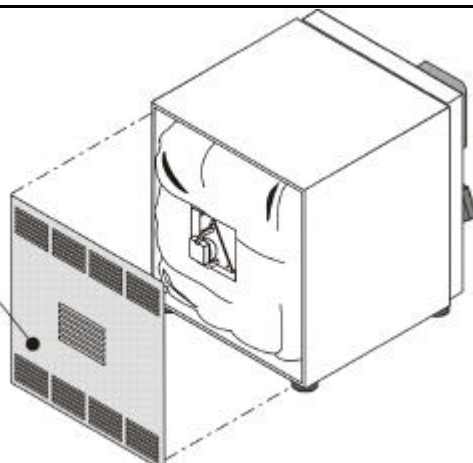
4.1 Changing of the controller R3

	
	<p>You have to open the two screws at the top of the inner door. After that you can lift out the inner door, but be careful the temperature safety device is inside the door.</p>
	<p>Now open the screw behind the white plastic cover. The plastic cover could be broken after that. Now you have to press like shown picture at the perpendicular side to bring out the controller housing. Please press only in arrow direction.</p>
	<p>Now you can take off the complete housing, be careful, the temperature safety device is connected.</p>
	<p>At the rear side of the housing you'll find two screws, you have to open them to work on the controller. To bring back the controller in starting situation, please fit it together in opposite direction.</p>

4.2 Changing of the fan at FD (E2) chamber

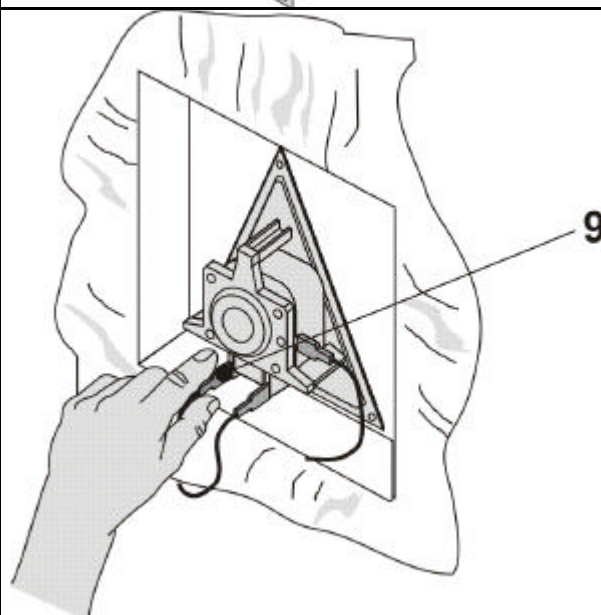
					
		<p>You have to unscrew the two side-walls (1 + 2), the bottom (3) and the rear-wall (4) to reach the fan-wheel.</p> <p>The side-walls are screwed at the topside. Before you could bring out the rear-wall, you have to remove the PT-100 holder.</p> <p>After this you can see the heating elements and also the fan-wheel</p>			
		<p>Now you have to open the nut at the front of the fan-wheel.</p> <p>Notice: It is a left-thread.</p> <p>Tool: box wrench size 13</p>			
		<p>Now it is possible to remove the washer and also the fan-wheel.</p>			

8



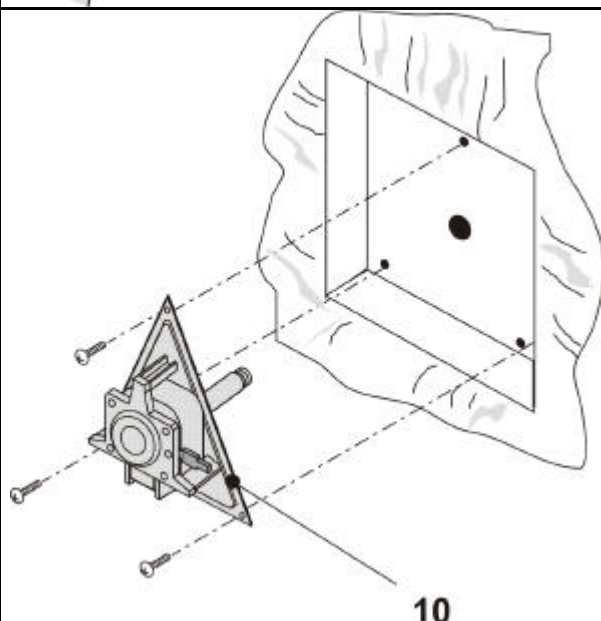
To take out the fan-motor with axis, you have to remove the rear-wall of the chamber.

Tool: Screwdriver (Phillips-Screw)



9

Now disconnect the connection-wires at the fan, if possible mark them for right connection when you put in the new fan.

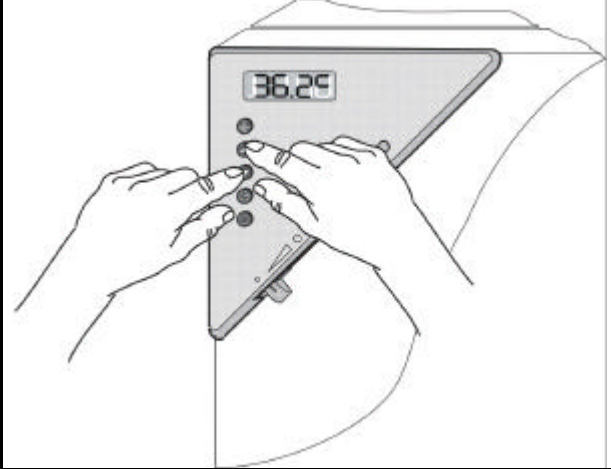


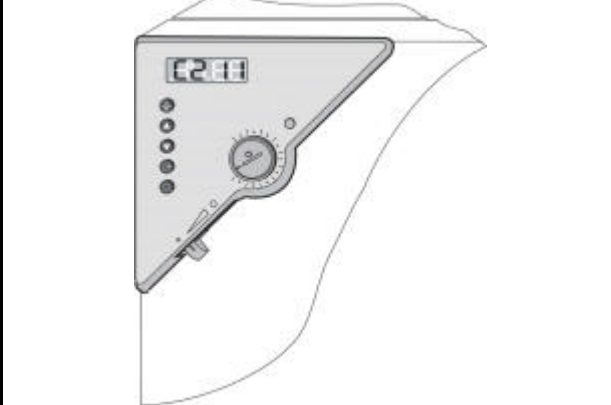
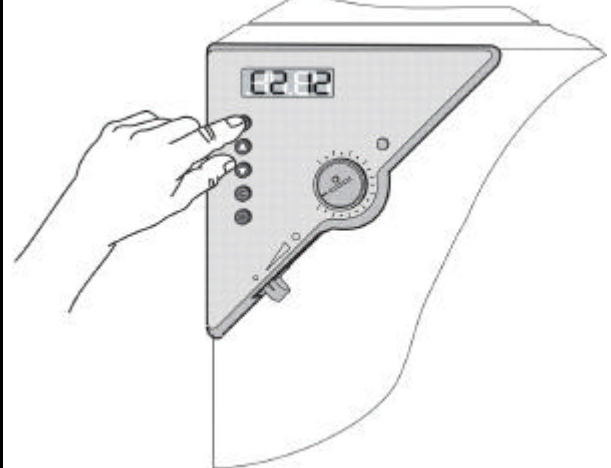

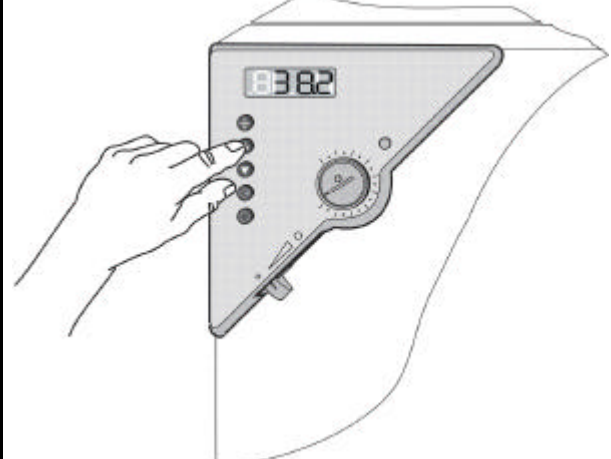




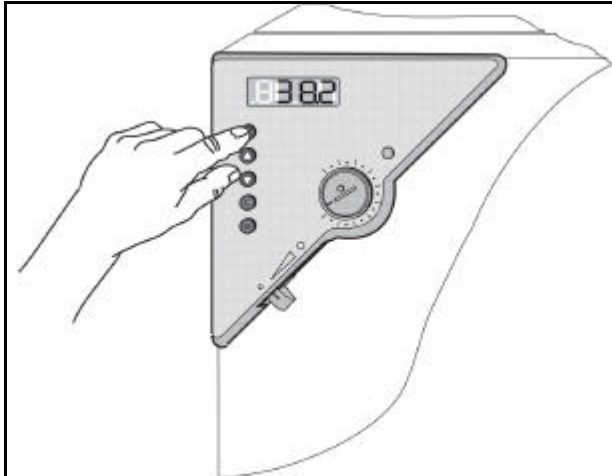
10


To take out the fan-motor with axis, you have to remove the three Phillips-screw at the triangle.

Now it is possible to take out the complete part.

4.3 Calibration Procedure “One Point Calibration”

	<p>Press the Buttons  and  for 5 sec. simultaneously.</p>
	<p>After the 5 sec. you'll see C211 in the display. Don't use this configuration for the One Point Calibration. You have to use the configuration C212.</p>
	<p>Press the Button  to go to configuration C212.</p>
	<p>Set the measured value with the Buttons  and  like displayed on your reference measurement system.</p>



If you've done your settings press the  Button to come back to the Standard Display with the actual Temperature.

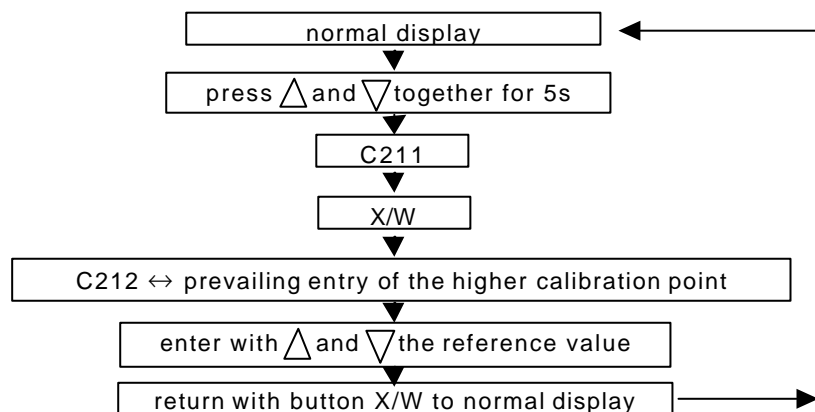
A electronic measuring- and display device for temperature which is traceable to a acknowledged standards/calibration institution (DKD , PTB for Germany) with valid calibration certificate is recommended.

Measuring range for incubators at least 20°C to 100°C

Measuring range for warming and drying chambers at least 20°C to 300°C

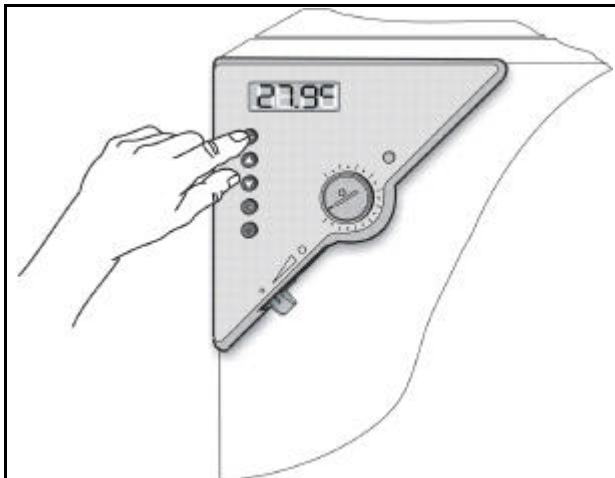

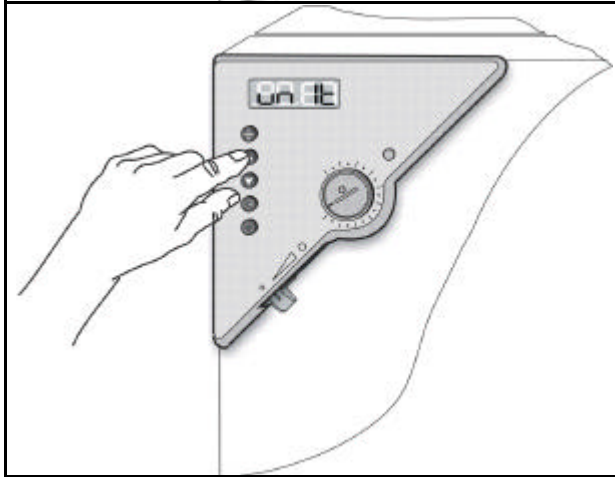

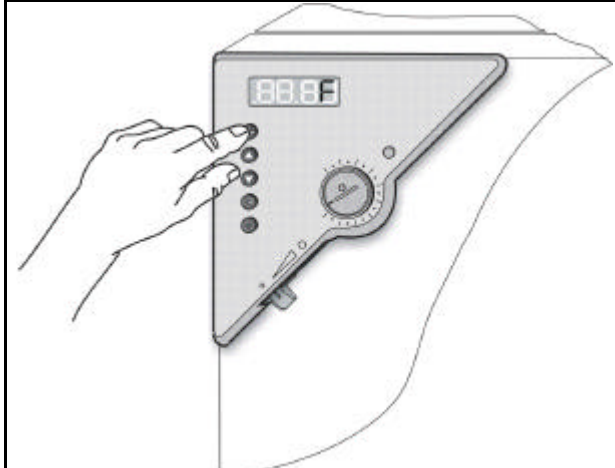


The sensor probe of the reference instrument placed in the centre of the usable chamber volume should be connected to the device via a thin cable suitable to be laid over the door sealing without causing any leakages.

Entering of the higher calibration point: (One-Point-Calibration))



Normally a "One-Point-Calibration" is enough to get a exact regulation of the chamber. If the customer works at two temperatures which are with a difference of more than 5°C you could do a "Two-Point-Calibration" to get a exact regulation.

4.4 Change Display from °C (Celsius) to °F (Fahrenheit)

	<p>Press the Button  for at least 5 seconds</p> <p>The Display shows „unit“.</p>
	<p>Change the setting “C” with the Button  into “F”</p> <p>Attention: The controller changes the value automatically into °F.</p>
	<p>Confirm your new setting by pressing the Button </p> <p>Press the Button  4 times to go back to the normal display</p>

Remember:

If you set the chamber to °F, the highest Temperature is 300°F. This corresponds to approx. 148,62°C.

Correlation:

$$0^{\circ}\text{C} = 31^{\circ}\text{F}$$

$$100^{\circ}\text{C} = 212^{\circ}\text{F}$$

$$[\text{Value in } ^{\circ}\text{F}] = 1,81 \times [\text{Value in } ^{\circ}\text{C}] + 31$$

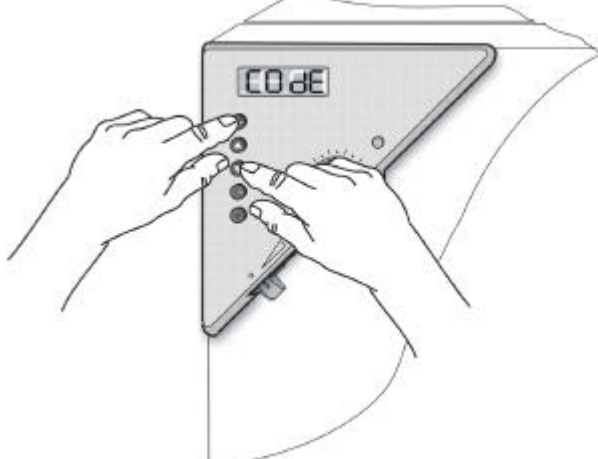


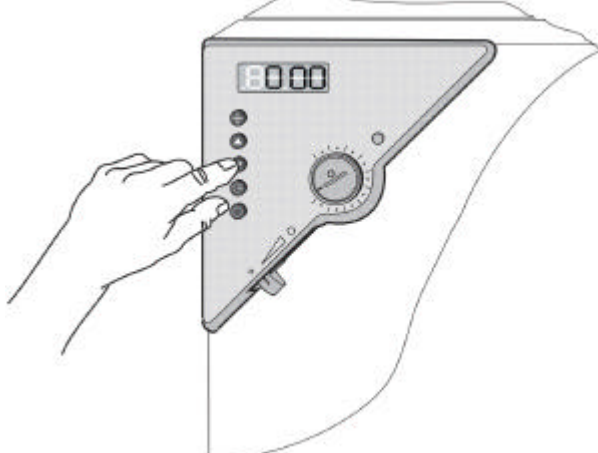

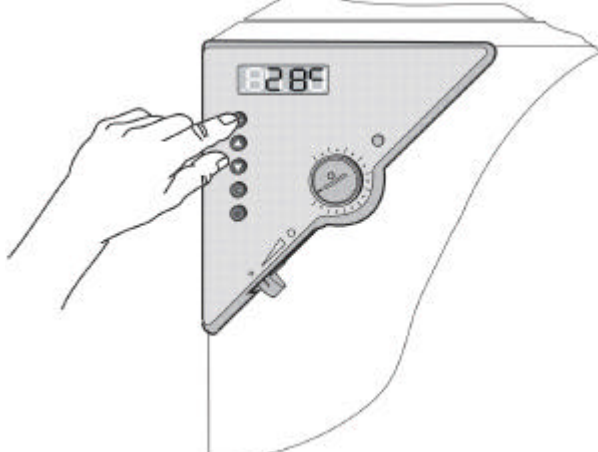

4.5 Activation or deactivation of 0.1 steps at the temperature display.

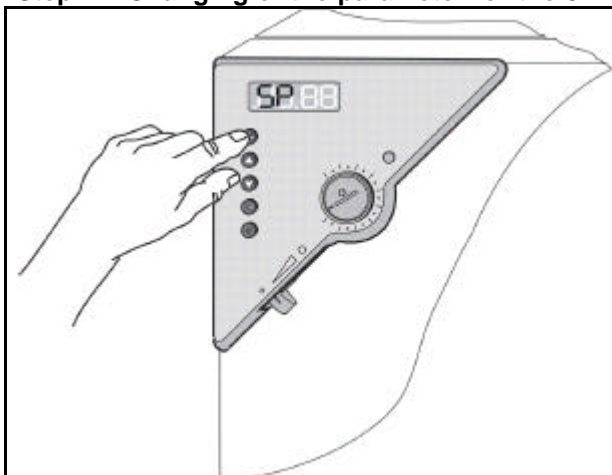
At the controller R3 it is possible to activate or deactivate the 0.1 step at the display.

At BD chambers which could heat up to 100°C the function is activated.

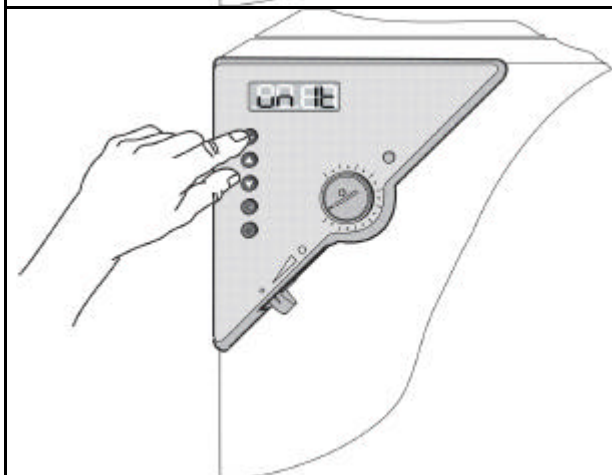
At ED and FD chambers the function is deactivated. Please note that the 0.1 steps is only displayed up to 99.9 °C, at 100°C the 0.1 step is deactivated automatically.

Step 1 – Deactivation of the Level-Protection

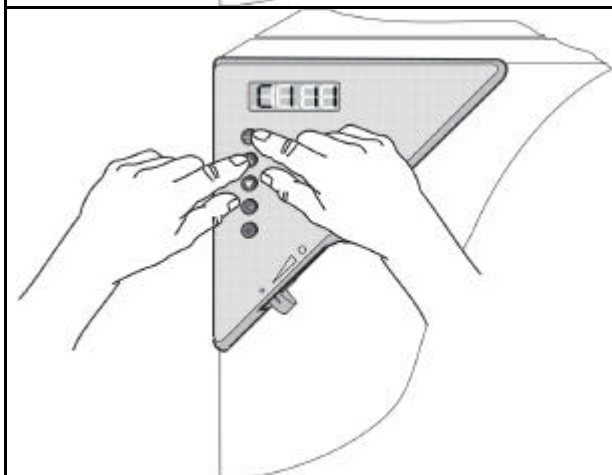
	<p>To access the parameter level you have to unlock the Level-Protection.</p> <p>You have to press the Button  and  for at least 10 seconds simultaneously</p>
	<p>Now you've reached the menu "Code"</p> <p>Press the Button  to set the value "001" to "000"</p>
	<p>To confirm your setting press the Button  to go back to the normal display</p>



Step 2 – Changing of the parameter for the 0.1 degree display

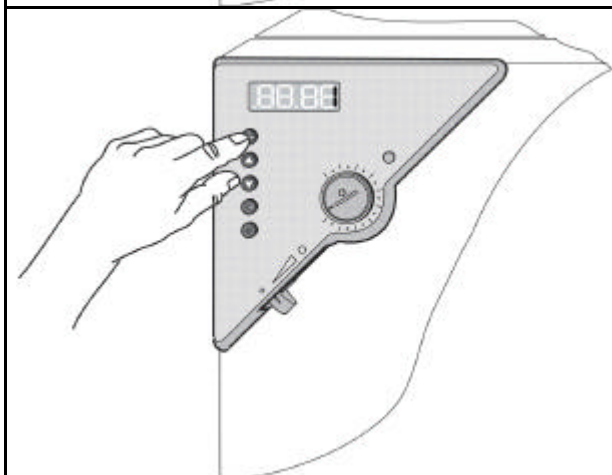
Press the Button  for at least 5 seconds
so that "unit" will be displayed



Press the Button  for at least 5 seconds again
so that "C111" will be displayed



Press the Button  for 1 time to set the "0" to "1"
Confirm your setting by pressing the Button 



Press the Button  18 times to go back to
normal display.

The displayed value now is with 0.1 step

Please restore the Level-Protection. If not it is possible that the parameters could be changed. The chamber doesn't work correctly.

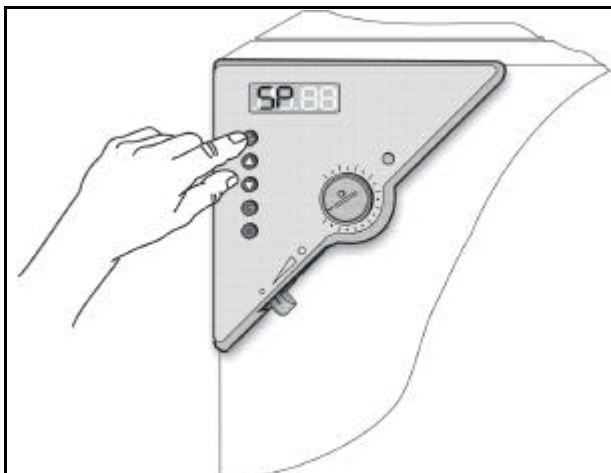

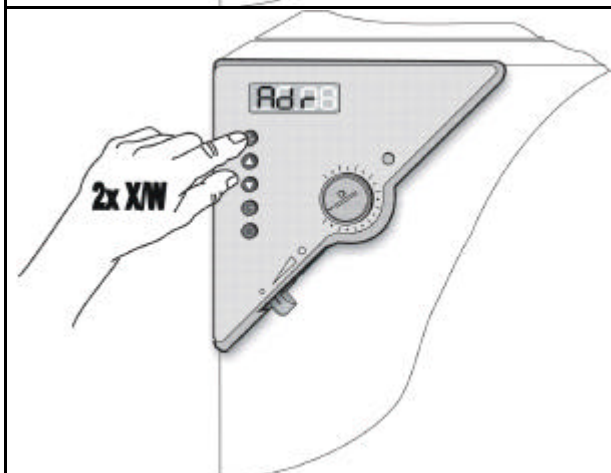

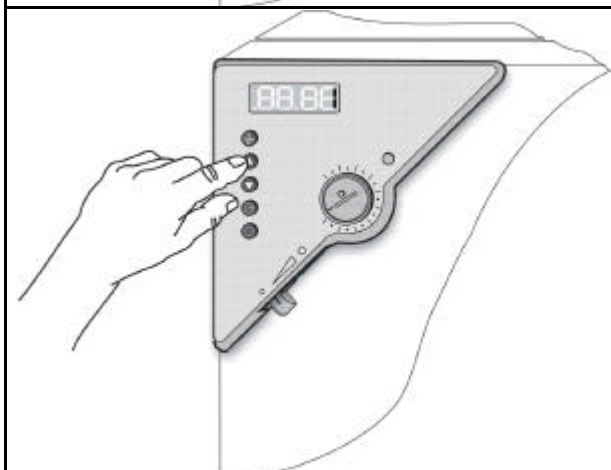



5 BD, ED and FD connected to APT-COM

5.1 Communication Software APT-COM

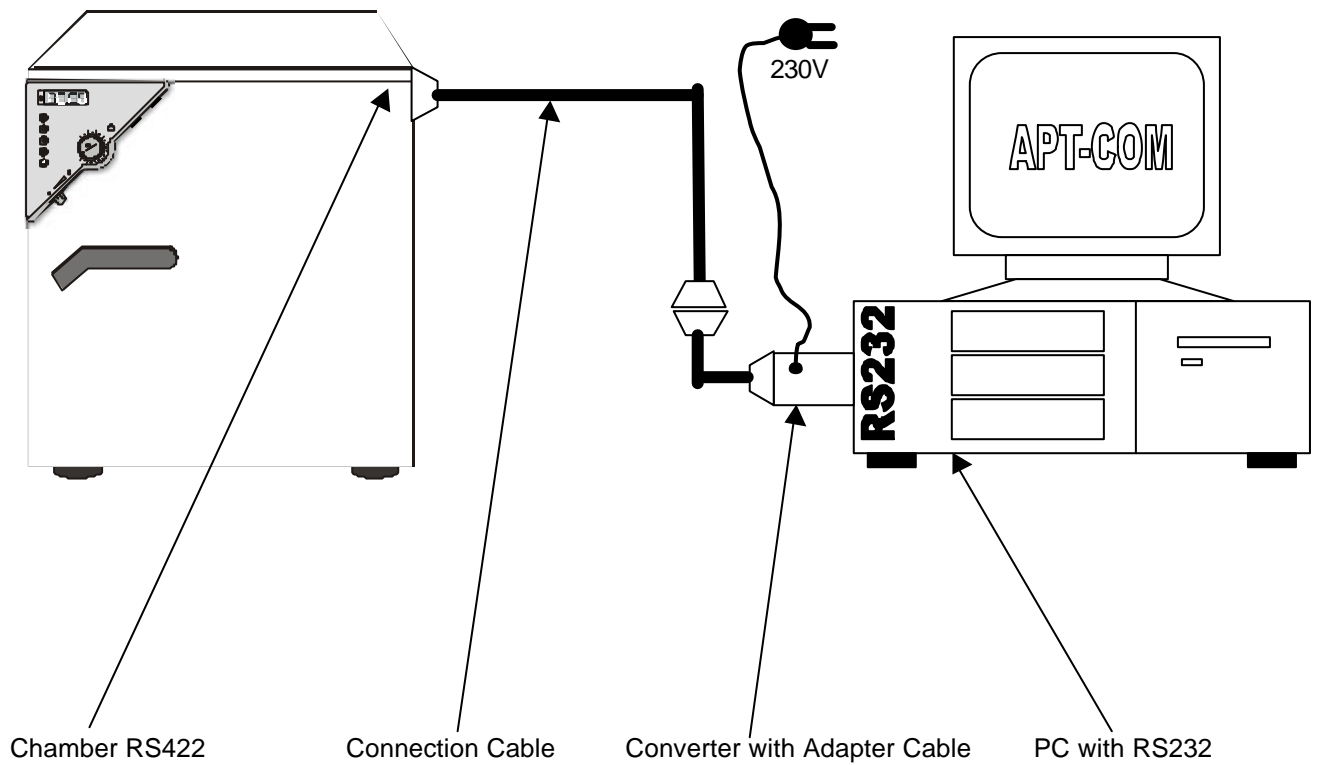
The units of size 400 and 720 are equipped as standard with an RS422 serial interface (option with size 53, 115 and 240), to which Binder's

5.2 Settings at the controller R3

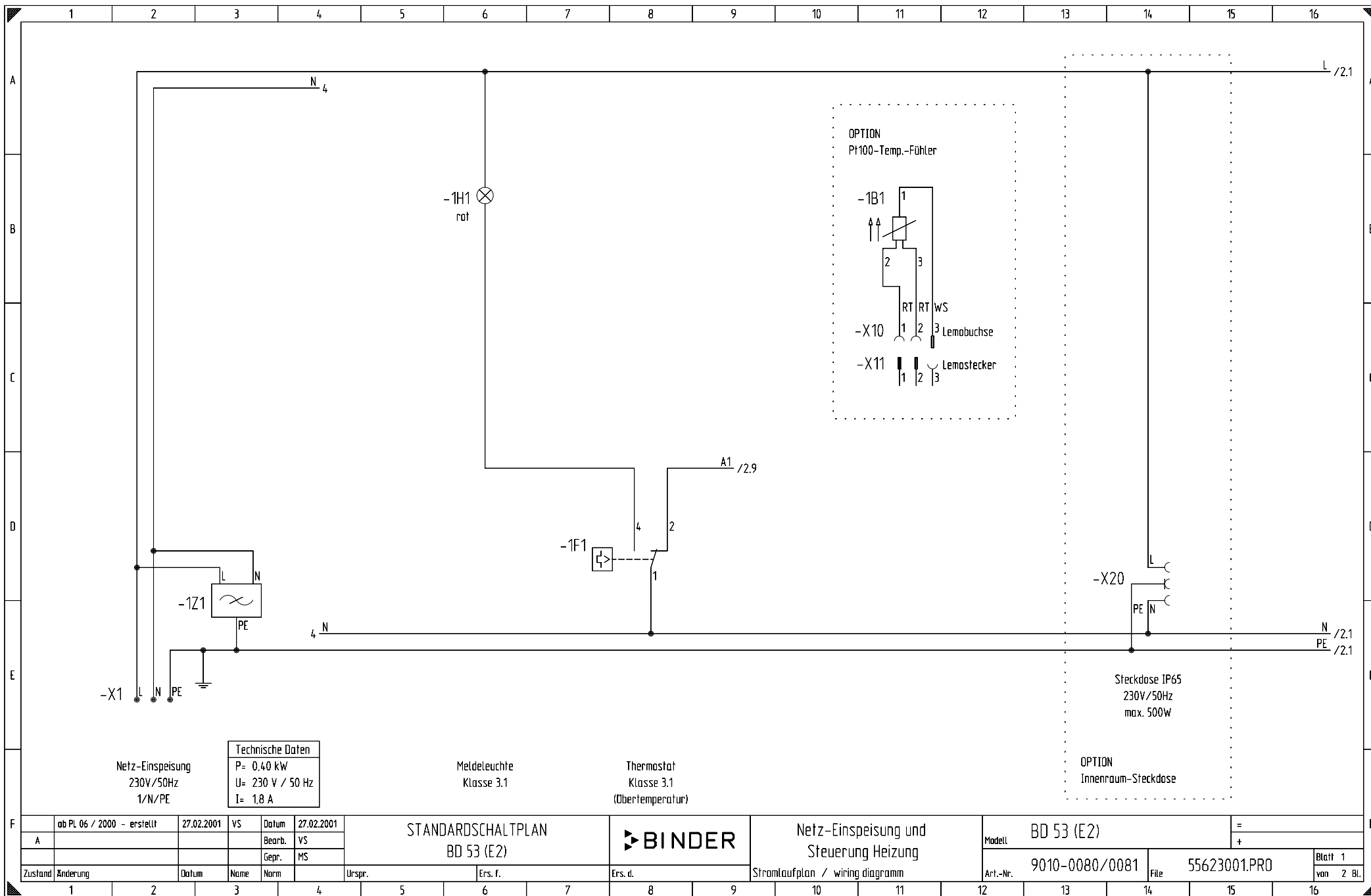
The factory setting of the controller is 1. You need this address, that the PC knows with which controller he has to exchange the data. The function is like a e-Mail System, every one needs a own address to get the correct data. If you connect more then one chamber, every one needs a own address (1.....30 max). Following described settings have to be done.

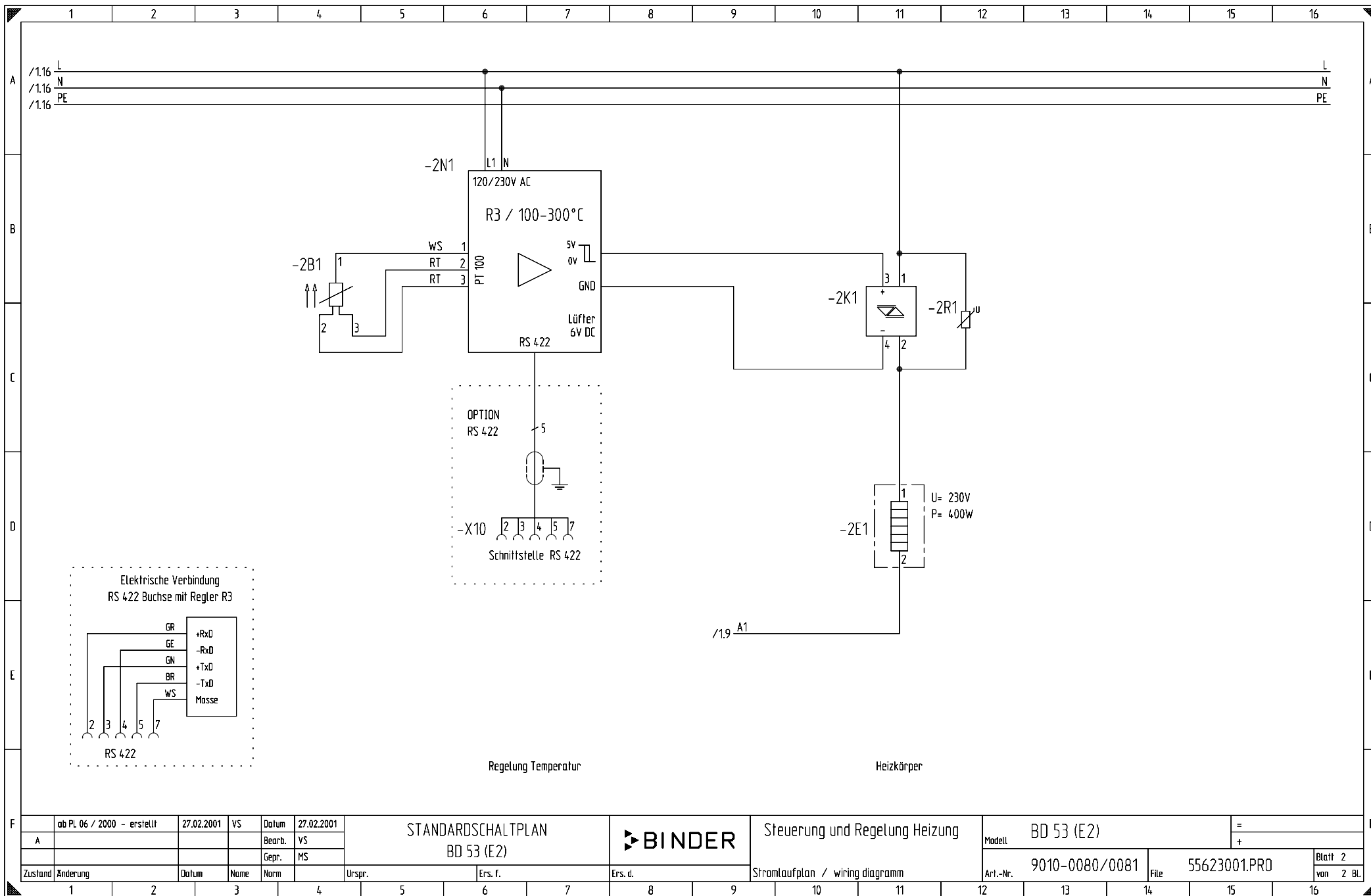
	<p>The chamber is switched on and shows the actual Temperature</p> <p>Press the Button  for 5 seconds at least</p> <p>Till the display shows "unit"</p>
	<p>Press the Button  2 times till the display shows "Adr" for 1 second</p>
	<p>The Display changes now automatically between „Adr“ and the entered Address.</p> <p>Now choose the Address with the Buttons  and .</p> <p>Confirm your setting with the Button  till you're Back at the Temperature-Display</p>


5.3 Connection of one chamber BD, ED or FD




If you'll connect more than one chambers, you need a plug-distributor between the chambers and the computer.

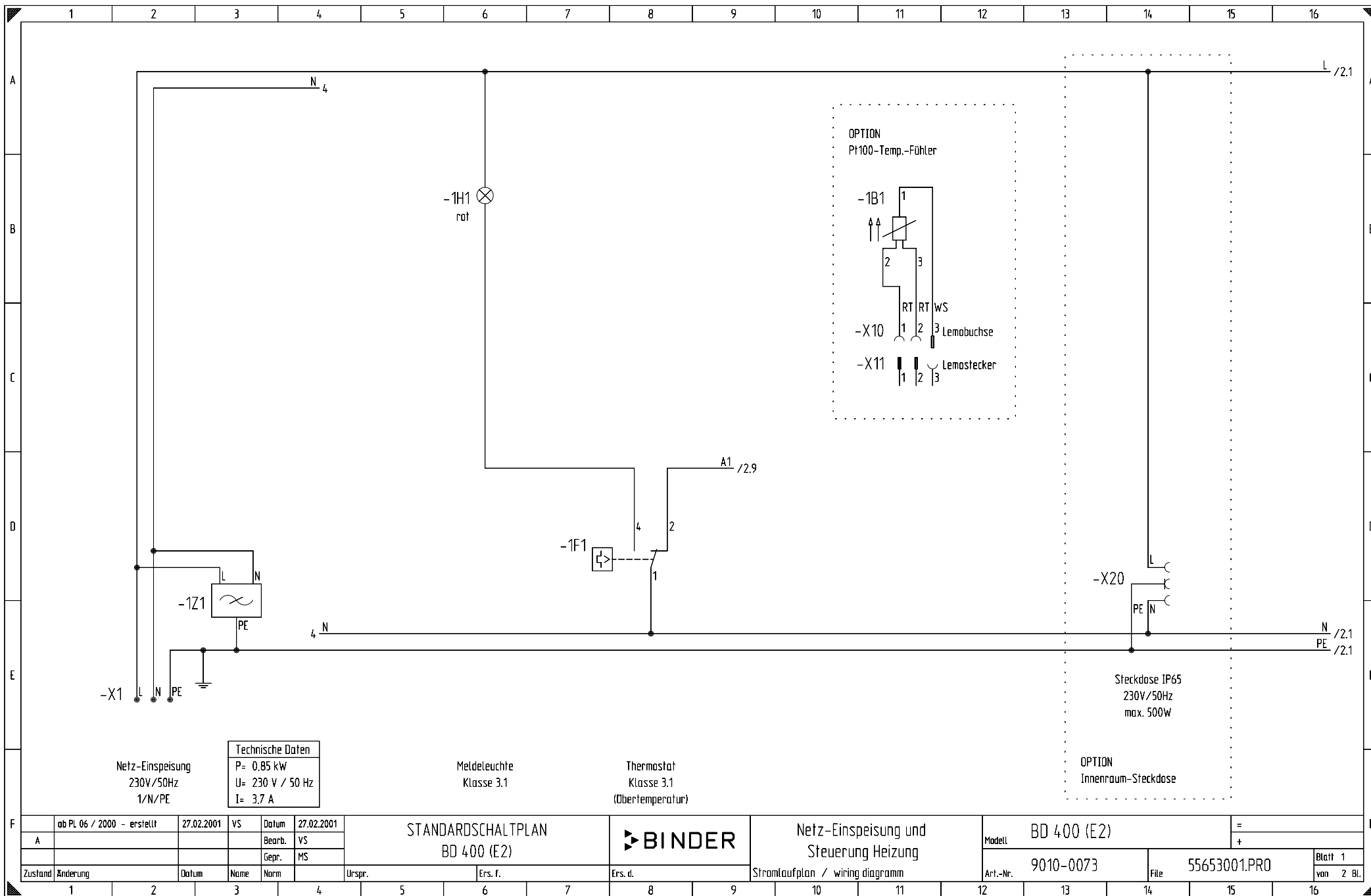


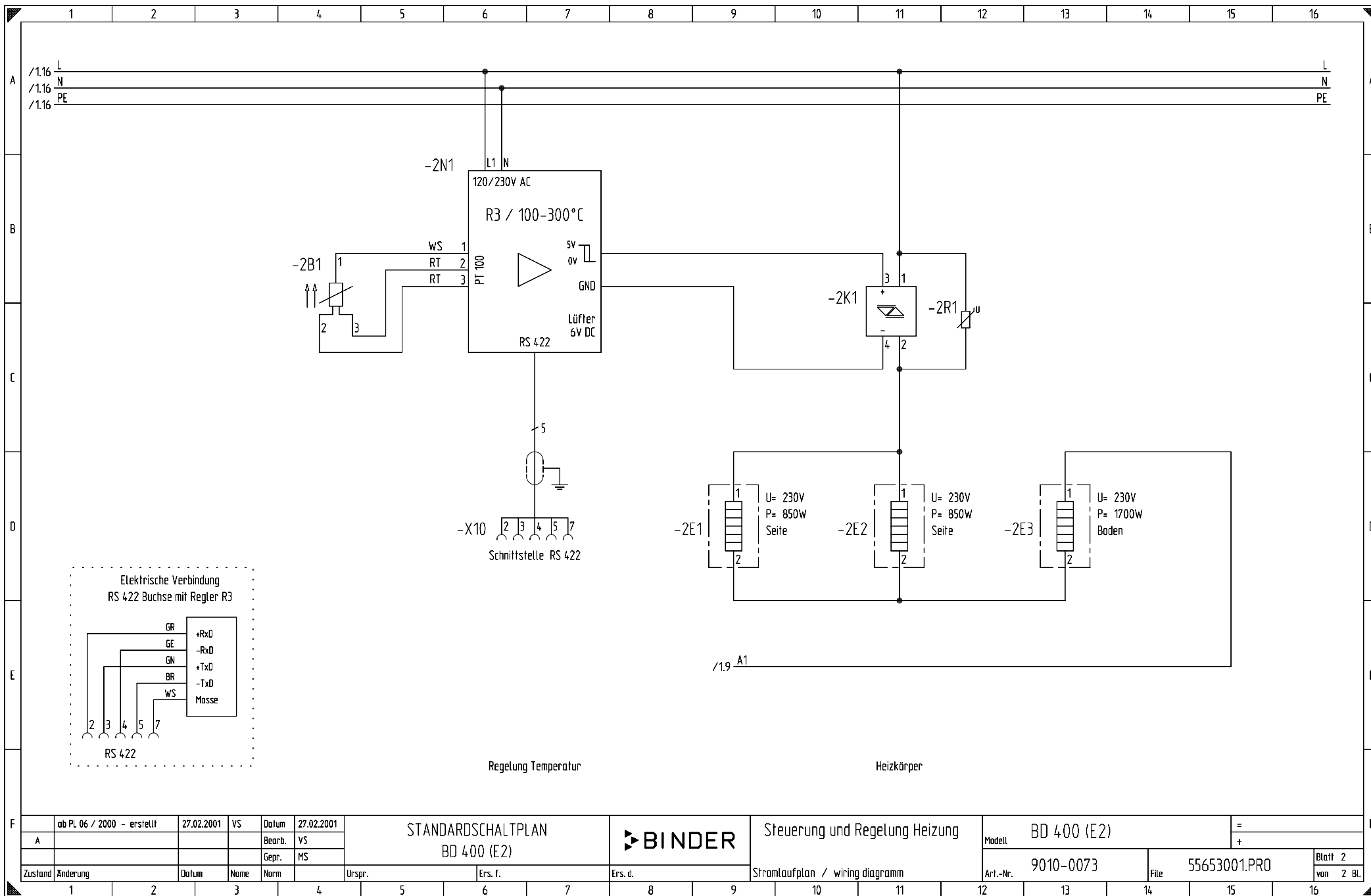


F	ab Pl. 06 / 2000 - erstellt		27.02.2001	VS	Datum	27.02.2001	STANDARDSCHALTPLAN BD 53 (E2)					Steuerung und Regelung Heizung	BD 53 (E2)				=						
	A				Bearb.	VS							Modell		+								
					Gepr.	MS																	
	Zustand		Änderung		Datum	Name	Norm		Urspr.	Ers. f.		Ers. d.	Stromlaufplan / wiring diagramm				Art.-Nr.		File		55623001.PRO		Blatt 2
	1	2		3			4		5	6	7	8	9	10	11	12	13	14	15	16	von 2 Bl.		

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16															
A	Pos. position	BmK. marking	Bezeichnung designation						Typenbezeichnung model number						Teilenummer part number		Bl./Pf. location		A												
	1	-X1	Kabelzugentlastung (3 Adern)						964 643 261 – Z 8,5 GK						6002-0004		1.2														
			Gerätezuleitung 230V AC						H05VV-F3G1,5 – 3x1,5mm² (sw)						5023-0002		1.2														
B	2	-1Z1	Einphasenfilter						KPB 7012/47/4700						5026-0001		1.3		B												
	3	-1H1	Anzeigeleuchte rot						Typ 9 – Nr. 31310						5008-0003		1.6														
	4	-1F1	Thermostat Kl 3.1, 0-120°C						EMF-1/B1						5006-0035		1.8														
C	5	-1B1	Pt 100 gerade + Aderendhülse						TN: 00355341						5002-0008		1.11		C												
	6	-X10	Buchse 3-polig wasserdicht						ERA.1E.303.CLL						5024-0026		1.11														
	7	-X11	Stecker 3-polig wasserdicht						FFA.1E.303.CLA.C40						5024-0027		1.11														
	8	-X20	Steckdose IP65 – 230VAC/16A						0501-4-2192						5024-0037		1.14														
			Stecker IP65						0501-4-2212						5024-0038		1.14														
	9	-2B1	Pt 100 gerade + Aderendhülse						TN: 00355341						5002-0008		2.4														
	10	-2N1	Regler R 3 (100-300°C)						Typ R3						5014-0052		2.6														
D	11	-X10	Kabel Schnittstelle RS 422						RS 422 für R3						5023-0050		2.7		D												
			Schnittstellenkarte RS 422						TN: 00381008 für R3						5014-0055		2.7														
	12	-2E1	Heizkörper 230V/400W						KR 53389						5005-0026		2.11														
E	13	-2K1	Halbleiterrelais 25A						D2425						5011-0022		2.11		E												
	14	-2R1	Varistor für Halbl.-Relais						S 20K 275						5018-0001		2.12														
F																			F												
F		ab PL 06 / 2000 – erstellt		27.02.2001		VS		Datum		27.02.2001		STANDARDSCHALTPLAN BD 53 (E2)				BINDER		Produktionsstückliste / production parts list				BD 53 (E2)		=		F					
A								Bearb.		VS								Modell				BD 53 (E2)		+							
								Gepr.		MS																Blatt 1 von 1 Bl.					
Zustand		Änderung		Datum		Name		Norm				Urspr.		Ers. f.		Ers. d.		Produktionsstückliste / production parts list				Art.-Nr.		9010-0080/0081		File		55623001.PRO			
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	

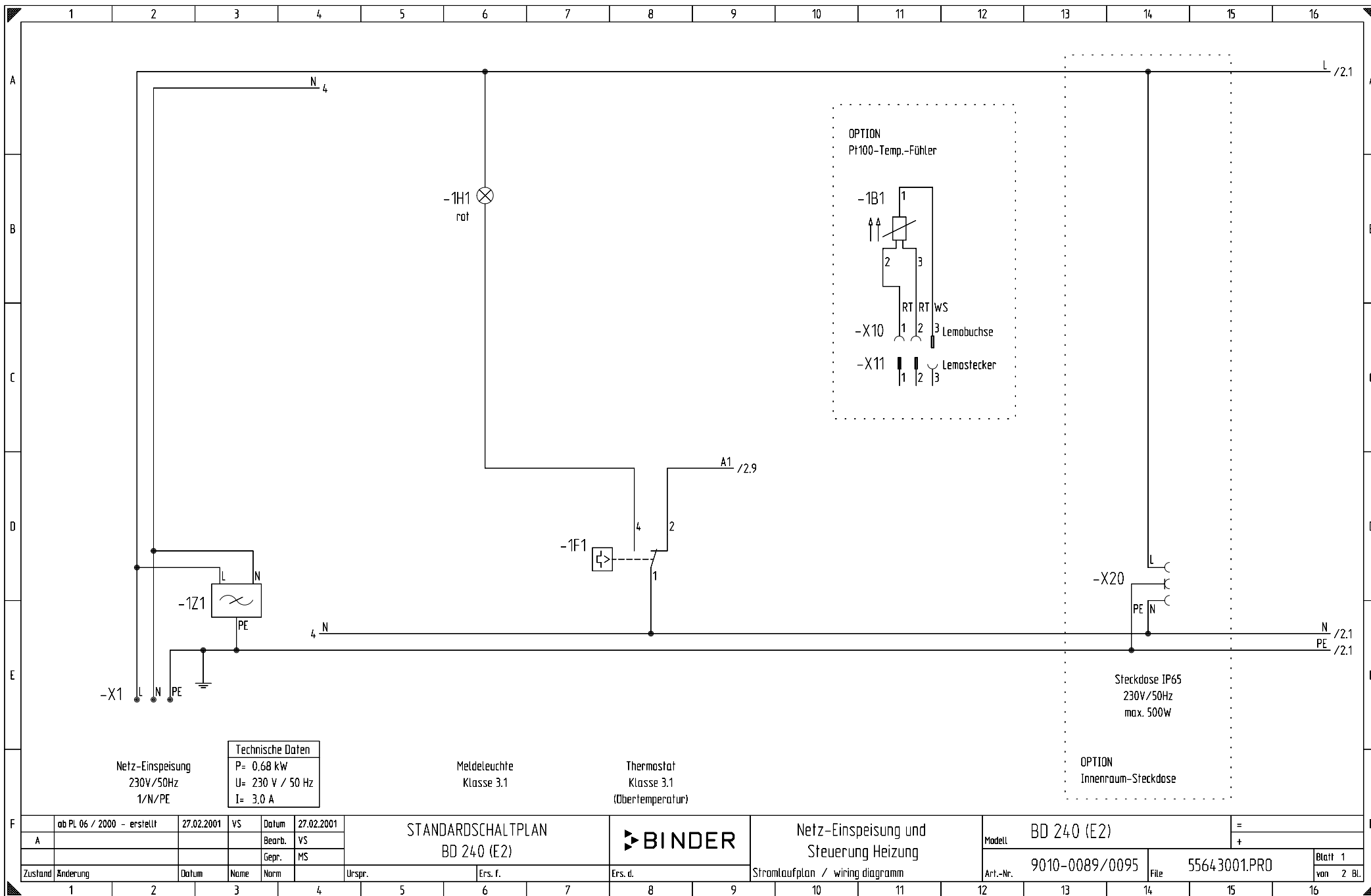
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16			
A	Pos. position	Bmk. marking		Bezeichnung designation				Typenbezeichnung model number								Teilenummer part number				Bl./Pf. location													
	1	-X1		cable connection				964 643 261 – Z 8,5 GK								6002-0004				1.2													
				net cable 230V AC				H05VV-F3G1,5 – 3x1,5mm² (sw)								5023-0002				1.2													
	2	-1Z1		net filter				KPB 7012/47/4700								5026-0001				1.3													
	3	-1H1		signal lamp red				type 9 – Nr. 31310								5008-0003				1.6													
	4	-1F1		thermometer Kl 3.1, 0-120°C				EMF-1/B1								5006-0035				1.8													
B	5	-1B1		Pt 100				TN: 00355341								5002-0008				1.11													
	6	-X10		socket 3-pole watertight				ERA.1E.303.CLL								5024-0026				1.11													
	7	-X11		connector 3-pole watertight				FFA.1E.303.CLA.C40								5024-0027				1.11													
	8	-X20		power socket IP65 – 230VAC/16A				0501-4-2192								5024-0037				1.14													
				mains plug IP65				0501-4-2212								5024-0038				1.14													
	9	-2B1		Pt 100				TN: 00355341								5002-0008				2.4													
	10	-2N1		controller R 3 (100-300°C)				type R3								5014-0052				2.6													
	11	-X10		cable interface RS 422				RS 422 for R3								5023-0050				2.7													
				interface RS422 (R3)				TN: 00381008								5014-0055				2.7													
D	12	-2E1		radiator 230V/400W				KR 53389								5005-0026				2.11													
	13	-2K1		solid state relay 25A				D2425								5011-0022				2.11													
	14	-2R1		varistor				S 20K 275								5018-0001				2.12													
E																																	
F																																	
ab Pl. 06 / 2000 – erstellt		27.02.2001		VS		Datum		27.02.2001		STANDARDSCHALTPLAN BD 53 (E2)										BD 53 (E2)						=		+					
A						Bearb.		VS																						Gepr.		MS	
Zustand		Änderung		Datum		Name		Norm		Urspr.		Ers. f.		Ers. d.		Produktionsstückliste / production parts list						Art.-Nr.		9010-0080/0081		File		55623001.PRO		Blatt 1		von 1 Bl.	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16			



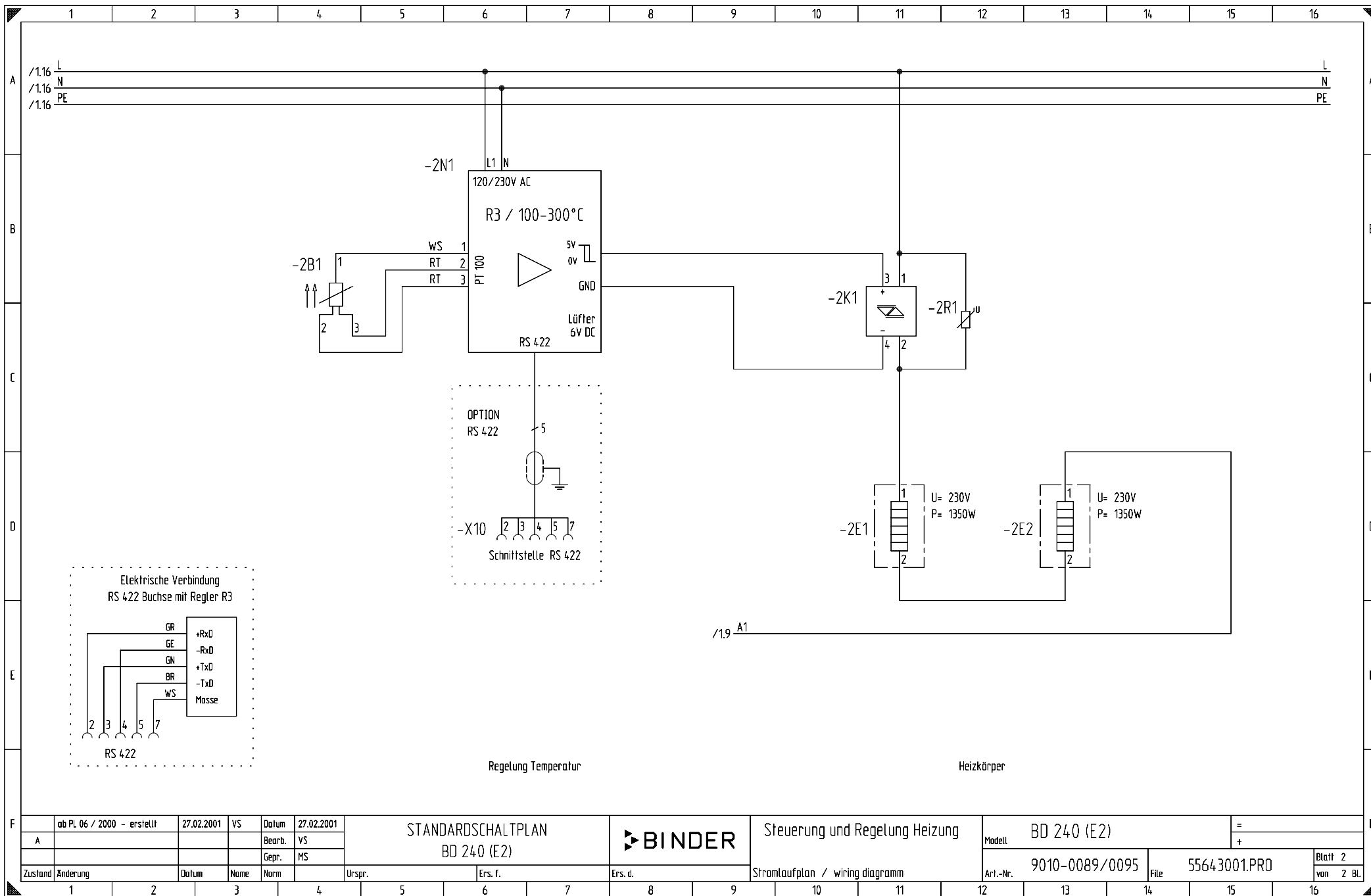


1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
A	Pos. position	BmK. marking		Bezeichnung designation								Typenbezeichnung model number								Teilenummer part number				Bl./Pf. location		A					
	1	-X1		Kabelzugentlastung (3 Adern)								964 643 261 - Z 8,5 GK								6002-0004				1.2			1.2				
				Gerätezuleitung 230V AC								H05VV-F3G1,5 - 3x1,5mm² (sw)								5023-0002											
B	2	-1Z1		Einphasenfilter								KPB 7012/47/4700								5026-0001				1.3		B					
	3	-1H1		Anzeigeleuchte rot								Typ 9 - Nr. 31310								5008-0003				1.6							
	4	-1F1		Thermostat Kl 3.1, 0-120°C								EMF-1/B1								5006-0035				1.8							
C	5	-1B1		Pt 100 gerade + Aderendhülse								TN: 00355341								5002-0008				1.11		C					
	6	-X10		Buchse 3-polig wasserdicht								ERA.1E.303.CLL								5024-0026				1.11							
	7	-X11		Stecker 3-polig wasserdicht								FFA.1E.303.CLA.C40								5024-0027				1.11							
D	8	-X20		Steckdose IP65 - 230VAC/16A								0501-4-2192								5024-0037				1.14		D					
				Stecker IP65								0501-4-2212								5024-0038				1.14							
	9	-2B1		Pt 100 gerade + Aderendhülse								TN: 00355341								5002-0008				2.4							
E	10	-2N1		Regler R 3 (100-300°C)								Typ R3								5014-0052				2.6		E					
	11	-X10		Kabel Schnittstelle RS 422								RS 422 für R3								5023-0050				2.7							
				Schnittstellenkarte RS 422								TN: 00381008 für R3								5014-0055				2.7							
F	12	-2E1		Heizkörper 230V/850W								KR 55485								5005-0031				2.9		F					
	13	-2E2		Heizkörper 230V/850W								KR 55485								5005-0031				2.11							
	14	-2K1		Halbleiterrelais 25A								D2425								5011-0022				2.11							
G	15	-2R1		Varistor für Halbl.-Relais								S 20K 275								5018-0001				2.12		G					
	16	-2E3		Heizkörper 230V/1700W								KR 55486								5005-0032				2.13							
H																										H					
I																										I					
J																										J					
K																										K					
L																										L					
M																										M					
N																										N					
O																										O					
P																										P					
Q																										Q					
R																										R					
S																										S					
T																										T					
U																										U					
V																										V					
W																										W					
X																										X					
Y																										Y					
Z																										Z					
AA																										AA					
AB																										AB					
AC																										AC					
AD																										AD					
AE																										AE					
AF																										AF					
AG																										AG					
AH																										AH					
AI																										AI					
AJ																										AJ					
AK																										AK					
AL																										AL					
AM																										AM					
AN																										AN					
AO																										AO					
AP																										AP					
AQ																										AQ					
AR																										AR					
AS																										AS					
AT																										AT					
AU																										AU					
AV																										AV					
AW																										AW					
AX																										AX					
AY																										AY					
AZ																										AZ					
BA																										BA					
BB																										BB					
BC																										BC					
BD																										BD					
BE																										BE					
BF																										BF					
BG																										BG					
BH																										BH					
BI																										BI					
BJ																										BJ					
BK																										BK					
BL																										BL					
BM																										BM					
BN																										BN					
BO																										BO					
BP																										BP					
BQ																										BQ					
BR																										BR					
BS																										BS					
BT																										BT					
BU																										BU					
BV																										BV					
BW																										BW					
BX																										BX					
BY																										BY					
BZ																															

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
A	Pos. position	BmK. marking	Bezeichnung designation						Typenbezeichnung model number						Teilenummer part number		Bl./Pf. location		A
	1	-X1	cable connection						964 643 261 – Z 8,5 GK						6002-0004		1.2		
			net cable 230V AC						H05VV-F3G1,5 – 3x1,5mm² (sw)						5023-0002		1.2		
B	2	-1Z1	net filter						KPB 7012/47/4700						5026-0001		1.3		B
	3	-1H1	signal lamp red						type 9 – Nr. 31310						5008-0003		1.6		
	4	-1F1	thermometer Kl 3.1, 0-120°C						EMF-1/B1						5006-0035		1.8		
C	5	-1B1	Pt 100						TN: 00355341						5002-0008		1.11		C
	6	-X10	socket 3-pole watertight						ERA.1E.303.CLL						5024-0026		1.11		
	7	-X11	connector 3-pole watertight						FFA.1E.303.CLA.C40						5024-0027		1.11		
D	8	-X20	power socket IP65 – 230VAC/16A						0501-4-2192						5024-0037		1.14		D
			mains plug IP65						0501-4-2212						5024-0038		1.14		
	9	-2B1	Pt 100						TN: 00355341						5002-0008		2.4		
E	10	-2N1	controller R 3 (100-300°C)						type R3						5014-0052		2.6		E
	11	-X10	cable interface RS 422						RS 422 for R3						5023-0050		2.7		
			interface RS422 (R3)						TN: 00381008						5014-0055		2.7		
F	12	-2E1	radiator 230V/850W						KR 55485						5005-0031		2.9		F
	13	-2E2	radiator 230V/850W						KR 55485						5005-0031		2.11		
	14	-2K1	solid state relay 25A						D2425						5011-0022		2.11		
G	15	-2R1	varistor						S 20K 275						5018-0001		2.12		G
	16	-2E3	radiator 230V/1700W						KR 55486						5005-0032		2.13		
H																			H
I																			I
J																			J
K																			K
L																			L
M																			M
N																			N
O																			O
P																			P
Q																			Q
R																			R
S																			S
T																			T
U																			U
V																			V
W																			W
X																			X
Y																			Y
Z																			Z
AA																			AA
AB																			AB
AC																			AC
AD																			AD
AE																			AE
AF																			AF
AG																			AG
AH																			AH
AI																			AI
AJ																			AJ
AK																			AK
AL																			AL
AM																			AM
AN																			AN
AO																			AO
AP																			AP
AQ																			AQ
AR																			AR
AS																			AS
AT																			AT
AU																			AU
AV																			AV
AW																			AW
AX																			AX
AY																			AY
AZ																			AZ
BA																			BA
BB																			BB
BC																			BC
BD																			BD
BE																			BE
BF																			BF
BG																			BG
BH																			BH
BI																			BI
BJ																			BJ
BK																			BK
BL																			BL
BM																			BM
BN																			BN
BO																			BO
BP																			BP
BQ																			BQ
BR																			BR
BS																			BS
BT																			BT
BU																			BU
BV																			BV
BW																			BW
BX																			BX
BY																			BY
BZ																			BZ
CA																			CA
CB																			CB
CC																			CC
CD																			CD
CE																			CE



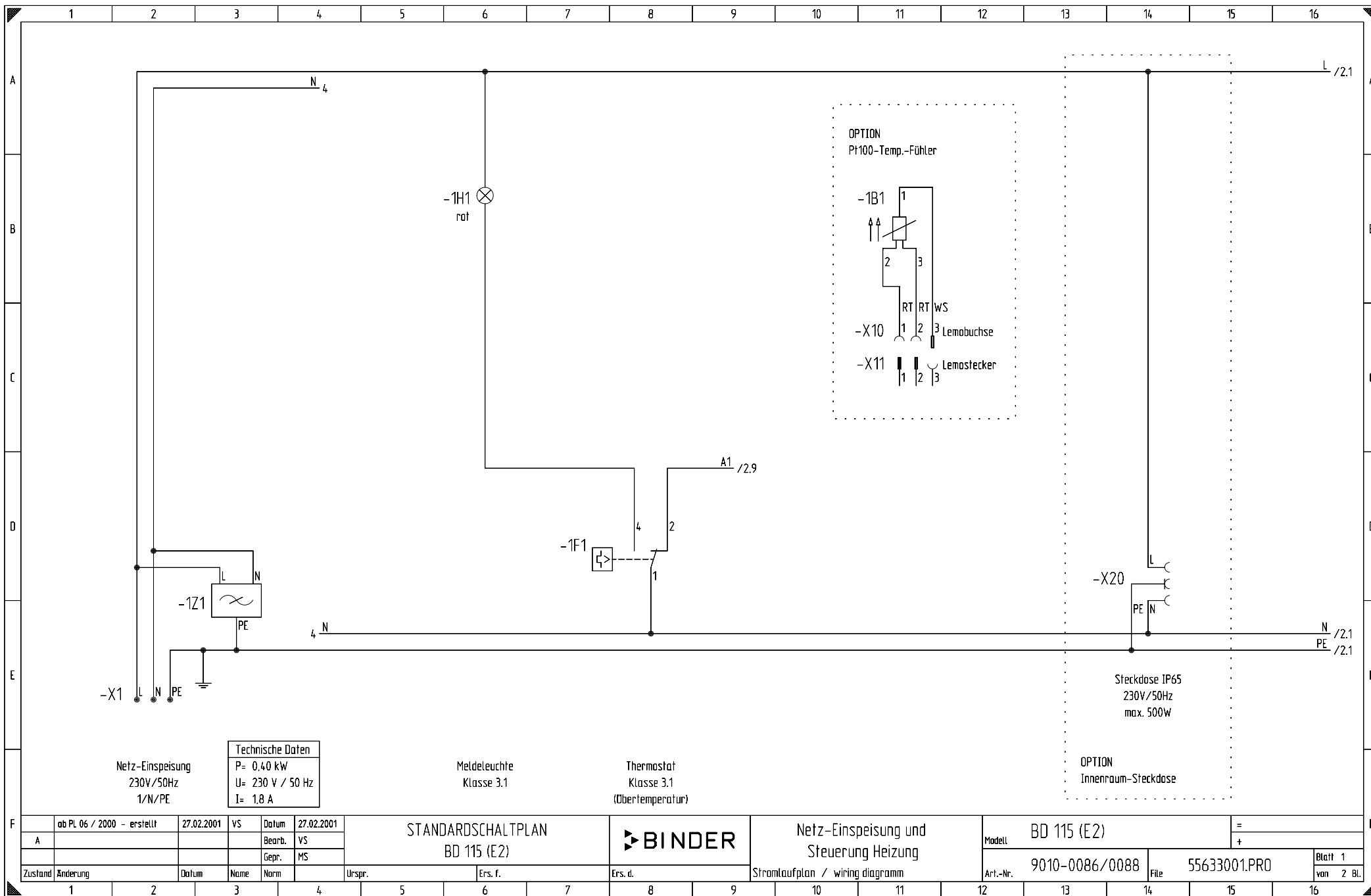
F	ab PL 06 / 2000 - erstellt	27.02.2001	VS	Datum	27.02.2001	STANDARDSCHALTPLAN BD 240 (E2)			BINDER		Netz-Einspeisung und Steuerung Heizung		Modell BD 240 (E2)		=		F
A				Bearb.	VS								Art.-Nr. 9010-0089/0095		File 55643001.PRO		Blatt 1
	Zustand	Änderung	Datum	Name	Norm	Urspr.	Ers. f.	Ers. d.	Stromlaufplan / wiring diagram								van 2 Bl.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	



F	ab Pl. 06 / 2000 - erstellt		27.02.2001	VS	Datum	27.02.2001	STANDARDSCHALTPLAN BD 240 (E2)					Steuerung und Regelung Heizung	Modell				BD 240 (E2)		=													
	A					Bearb.							VS					+														
						Gepr.							MS																			
	Zustand		Änderung		Datum	Name	Norm		Urspr.		Ers. f.		Ers. d.		Stromlaufplan / wiring diagramm				Art.-Nr.		9010-0089/0095		File		55643001.PRO		Blatt 2					
1		2			3			4		5		6		7		8		9		10		11		12		13		14		15		16

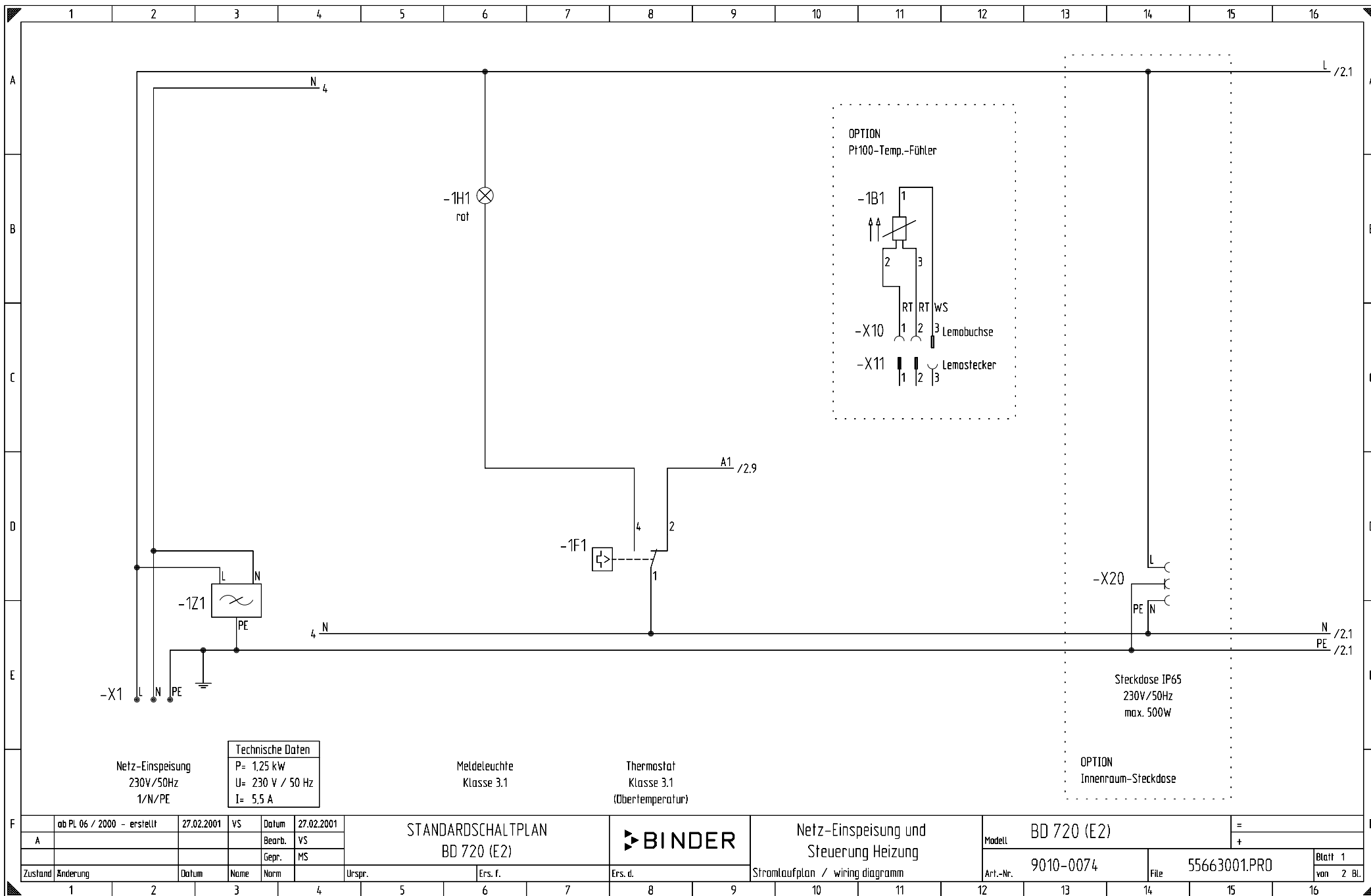
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
A	Pos. position	BmK. marking	Bezeichnung designation						Typenbezeichnung model number						Teilenummer part number		Bl./Pf. location		A
	1	-X1	Kabelzugentlastung (3 Adern)						964 643 261 – Z 8,5 GK						6002-0004		1.2		
			Gerätezuleitung 230V AC						H05VV-F3G1,5 – 3x1,5mm² (sw)						5023-0002		1.2		
B	2	-1Z1	Einphasenfilter						KPB 7012/47/4700						5026-0001		1.3		B
	3	-1H1	Anzeigeleuchte rot						Typ 9 – Nr. 31310						5008-0003		1.6		
	4	-1F1	Thermostat Kl 3.1, 0–120°C						EMF-1/B1						5006-0035		1.8		
	5	-1B1	Pt 100 gerade + Aderendhülse						TN: 00355341						5002-0008		1.11		
	6	-X10	Buchse 3-polig wasserdicht						ERA.1E.303.CLL						5024-0026		1.11		
	7	-X11	Stecker 3-polig wasserdicht						FFA.1E.303.CLA.C40						5024-0027		1.11		
C	8	-X20	Steckdose IP65 – 230VAC/16A						0501-4-2192						5024-0037		1.14		C
			Stecker IP65						0501-4-2212						5024-0038		1.14		
	9	-2B1	Pt 100 gerade + Aderendhülse						TN: 00355341						5002-0008		2.4		
D	10	-2N1	Regler R 3 (100–300°C)						Typ R3						5014-0052		2.6		D
	11	-X10	Kabel Schnittstelle RS 422						RS 422 für R3						5023-0050		2.7		
			Schnittstellenkarte RS 422						TN: 00381008 für R3						5014-0055		2.7		
	12	-2E1	Heizkörper 230V/1350W						KR 54659						5005-0030		2.11		
	13	-2K1	Halbleiterrelais 25A						D2425						5011-0022		2.11		
E	14	-2R1	Varistor für Halbl.-Relais						S 20K 275						5018-0001		2.12		E
	15	-2E2	Heizkörper 230V/1350W						KR 54659						5005-0030		2.13		
F																			F


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
A	Pos. position	BmK. marking	Bezeichnung designation						Typenbezeichnung model number						Teilenummer part number		Bl./Pf. location		A
	1	-X1	cable connection						964 643 261 – Z 8,5 GK						6002-0004		1.2		
			net cable 230V AC						H05VV-F3G1,5 – 3x1,5mm² (sw)						5023-0002		1.2		
B	2	-1Z1	net filter						KPB 7012/47/4700						5026-0001		1.3		B
	3	-1H1	signal lamp red						type 9 – Nr. 31310						5008-0003		1.6		
	4	-1F1	thermometer Kl 3.1, 0-120°C						EMF-1/B1						5006-0035		1.8		
C	5	-1B1	Pt 100						TN: 00355341						5002-0008		1.11		C
	6	-X10	socket 3-pole watertight						ERA.1E.303.CLL						5024-0026		1.11		
	7	-X11	connector 3-pole watertight						FFA.1E.303.CLA.C40						5024-0027		1.11		
D	8	-X20	power socket IP65 – 230VAC/16A						0501-4-2192						5024-0037		1.14		D
			mains plug IP65						0501-4-2212						5024-0038		1.14		
	9	-2B1	Pt 100						TN: 00355341						5002-0008		2.4		
E	10	-2N1	controller R 3 (100-300°C)						type R3						5014-0052		2.6		E
	11	-X10	cable interface RS 422						RS 422 for R3						5023-0050		2.7		
			interface RS422 (R3)						TN: 00381008						5014-0055		2.7		
F	12	-2E1	radiator 230V/1350W						KR 54659						5005-0030		2.11		F
	13	-2K1	solid state relay 25A						D2425						5011-0022		2.11		
	14	-2R1	varistor						S 20K 275						5018-0001		2.12		
G	15	-2E2	radiator 230V/1350W						KR 54659						5005-0030		2.13		G
H																			H
I																			I
J																			J
K																			K
L																			L
M																			M
N																			N
O																			O
P																			P
Q																			Q
R																			R
S																			S
T																			T
U																			U
V																			V
W																			W
X																			X
Y																			Y
Z																			Z
AA																			AA
AB																			AB
AC																			AC
AD																			AD
AE																			AE
AF																			AF
AG																			AG
AH																			AH
AI																			AI
AJ																			AJ
AK																			AK
AL																			AL
AM																			AM
AN																			AN
AO																			AO
AP																			AP
AQ																			AQ
AR																			AR
AS																			AS
AT																			AT
AU																			AU
AV																			AV
AW																			AW
AX																			AX
AY																			AY
AZ																			AZ
BA																			BA
BB																			BB
BC																			BC
BD																			BD
BE																			BE
BF																			BF
BG																			BG
BH																			BH
BI																			BI
BJ																			BJ
BK																			BK
BL																			BL
BM																			BM
BN																			BN
BO																			BO
BP																			BP
BQ																			BQ
BR																			BR
BS																			BS
BT																			BT
BU																			BU
BV																			BV
BW																			BW
BX																			BX
BY																			BY
BZ																			BZ
CA																			CA
CB																			CB
CC																			CC
CD																			CD
CE																			CE
CF															</				

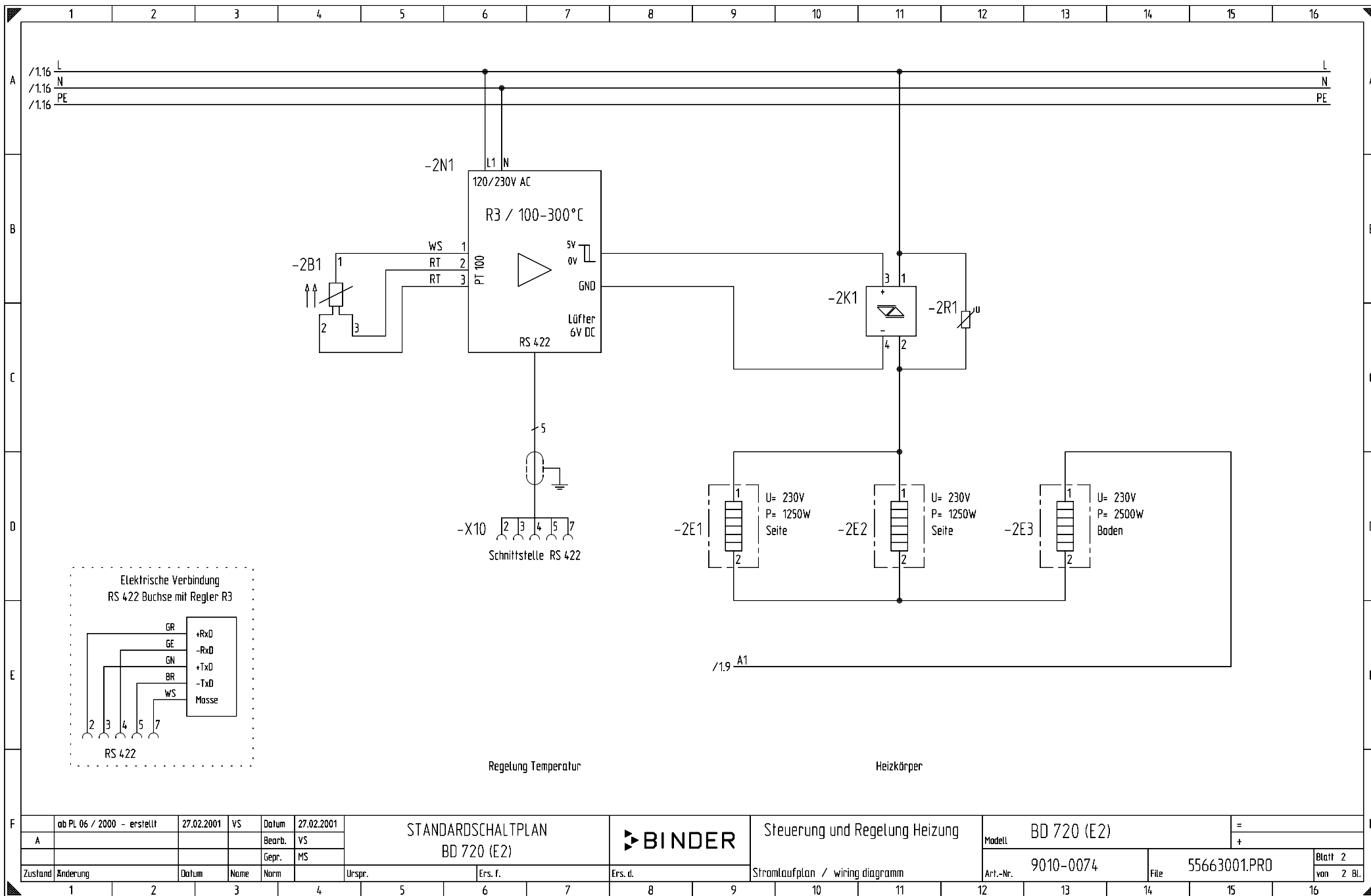


1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
A	Pos. position	BmK. marking		Bezeichnung designation						Typenbezeichnung model number								Teilenummer part number				Bl./Pf. location		A							
	1	-X1		Kabelzugentlastung (3 Adern)						964 643 261 – Z 8,5 GK								6002-0004				1.2									
				Gerätezuleitung 230V AC						H05VV-F3G1,5 – 3x1,5mm² (sw)								5023-0002				1.2									
B	2	-1Z1		Einphasenfilter						KPB 7012/47/4700								5026-0001				1.3		B							
	3	-1H1		Anzeigeleuchte rot						Typ 9 – Nr. 31310								5008-0003				1.6									
	4	-1F1		Thermostat Kl 3.1, 0-120°C						EMF-1/B1								5006-0035				1.8									
C	5	-1B1		Pt 100 gerade + Aderendhülse						TN: 00355341								5002-0008				1.11		C							
	6	-X10		Buchse 3-polig wasserdicht						ERA.1E.303.CLL								5024-0026				1.11									
	7	-X11		Stecker 3-polig wasserdicht						FFA.1E.303.CLA.C40								5024-0027				1.11									
D	8	-X20		Steckdose IP65 – 230VAC/16A						0501-4-2192								5024-0037				1.14		D							
				Stecker IP65						0501-4-2212								5024-0038				1.14									
	9	-2B1		Pt 100 gerade + Aderendhülse						TN: 00355341								5002-0008				2.4									
E	10	-2N1		Regler R 3 (100-300°C)						Typ R3								5014-0052				2.6		E							
	11	-X10		Kabel Schnittstelle RS 422						RS 422 für R3								5023-0050				2.7									
				Schnittstellenkarte RS 422						TN: 00381008 für R3								5014-0055				2.7									
F	12	-2E1		Heizkörper 230V/400W						KR 53469								5005-0028				2.11		F							
	13	-2K1		Halbleiterrelais 25A						D2425								5011-0022				2.11									
	14	-2R1		Varistor für Halbl.-Relais						S 20K 275								5018-0001				2.12									
F																								F							
ab PL 06 / 2000 – erstellt		27.02.2001		VS	Datum	27.02.2001		STANDARDSCHALTPLAN						BINDER				BD 115 (E2)				=									
A					Bearb.	VS		BD 115 (E2)										Modell				+									
						Gepr.	MS												Art.-Nr.		9010-0086/0088		File		55633001.PRO		Blatt 1				
Zustand		Änderung		Datum		Name		Norm				Urspr.		Ers. f.		Ers. d.		Produktionsstückliste / production parts list				Art.-Nr.		9010-0086/0088		File		55633001.PRO		Blatt 1	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16								
A	Pos. position	BmK. marking	Bezeichnung designation						Typenbezeichnung model number						Teilenummer part number		Bl./Pf. location		A					
	1	-X1	cable connection						964 643 261 – Z 8,5 GK						6002-0004		1.2							
			net cable 230V AC						H05VV-F3G1,5 – 3x1,5mm² (sw)						5023-0002		1.2							
B	2	-1Z1	net filter						KPB 7012/47/4700						5026-0001		1.3		B					
	3	-1H1	signal lamp red						type 9 – Nr. 31310						5008-0003		1.6							
	4	-1F1	thermometer Kl 3.1, 0-120°C						EMF-1/B1						5006-0035		1.8							
C	5	-1B1	Pt 100						TN: 00355341						5002-0008		1.11		C					
	6	-X10	socket 3-pole watertight						ERA.1E.303.CLL						5024-0026		1.11							
	7	-X11	connector 3-pole watertight						FFA.1E.303.CLA.C40						5024-0027		1.11							
D	8	-X20	power socket IP65 – 230VAC/16A						0501-4-2192						5024-0037		1.14		D					
			mains plug IP65						0501-4-2212						5024-0038		1.14							
	9	-2B1	Pt 100						TN: 00355341						5002-0008		2.4							
E	10	-2N1	controller R 3 (100-300°C)						type R3						5014-0052		2.6		E					
	11	-X10	cable interface RS 422						RS 422 for R3						5023-0050		2.7							
			interface RS422 (R3)						TN: 00381008						5014-0055		2.7							
F	12	-2E1	radiator 230V/400W						KR 53469						5005-0028		2.11		F					
	13	-2K1	solid state relay 25A						D2425						5011-0022		2.11							
	14	-2R1	varistor						S 20K 275						5018-0001		2.12							
F																			F					
F		ab PL 06 / 2000 – erstellt		27.02.2001	VS	Datum	27.02.2001	STANDARDSCHALTPLAN BD 115 (E2)				BINDER			Modell			BD 115 (E2)		=		F		
A						Bearb.	VS											+						
						Gepr.	MS																	
Zustand		Änderung		Datum	Name	Norm		Urspr.	Ers. f.		Ers. d.		Produktionsstückliste / production parts list			Art.-Nr.		9010-0086/0088		File	55633001.PRO		Blatt 1	F
1		2		3	4	5	6	7	8	9	10	11	12	13	14	15	16	von 1 Bl.						



F	ab Pl. 06 / 2000 - erstellt		27.02.2001	VS	Datum	27.02.2001	STANDARDSCHALTPLAN BD 720 (E2)				Netz-Einspeisung und Steuerung Heizung	Modell				BD 720 (E2)		=													
	A				Bearb.	VS										+															
					Gepr.	MS																									
	Zustand		Änderung		Datum	Name	Norm	Urspr.		Ers. f.		Ers. d.		Stromlaufplan / wiring diagram				Art.-Nr.		9010-0074		File		55663001.PRO		Blatt 1					
	1		2			3		4	5		6		7		8		9		10		11		12		13		14		15		16



1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
A	Pos. position	BmK. marking		Bezeichnung designation				Typenbezeichnung model number								Teilenummer part number				Bl./Pf. location		A									
	1	-X1		Kabelzugentlastung (3 Adern)				964 643 261 – Z 8,5 GK								6002-0004				1.2											
				Gerätezuleitung 230V AC				H05VV-F3G1,5 – 3x1,5mm² (sw)								5023-0002				1.2											
B	2	-1Z1		Einphasenfilter				KPB 7012/47/4700								5026-0001				1.3		B									
	3	-1H1		Anzeigeleuchte rot				Typ 9 – Nr. 31310								5008-0003				1.6											
	4	-1F1		Thermostat Kl 3.1, 0-120°C				EMF-1/B1								5006-0035				1.8											
C	5	-1B1		Pt 100 gerade + Aderendhülse				TN: 00355341								5002-0008				1.11		C									
	6	-X10		Buchse 3-polig wasserdicht				ERA.1E.303.CLL								5024-0026				1.11											
	7	-X11		Stecker 3-polig wasserdicht				FFA.1E.303.CLA.C40								5024-0027				1.11											
D	8	-X20		Steckdose IP65 – 230VAC/16A				0501-4-2192								5024-0037				1.14		D									
				Stecker IP65				0501-4-2212								5024-0038				1.14											
	9	-2B1		Pt 100 gerade + Aderendhülse				TN: 00355341								5002-0008				2.4											
E	10	-2N1		Regler R 3 (100-300°C)				Typ R3								5014-0052				2.6		E									
	11	-X10		Kabel Schnittstelle RS 422				RS 422 für R3								5023-0050				2.7											
				Schnittstellenkarte RS 422				TN: 00381008 für R3								5014-0055				2.7											
F	12	-2E1		Heizkörper 230V/1250W				KR 55741								5005-0033				2.9		F									
	13	-2E2		Heizkörper 230V/1250W				KR 55741								5005-0033				2.11											
	14	-2K1		Halbleiterrelais 25A				D2425								5011-0022				2.11											
G	15	-2R1		Varistor für Halbl.-Relais				S 20K 275								5018-0001				2.12		G									
	16	-2E3		Heizkörper 230V/2500W				KR 55742								5005-0034				2.13											
H																						H									
I	ab PL 06 / 2000 – erstellt		27.02.2001		VS		Datum		27.02.2001		STANDARDSCHALTPLAN BD 720 (E2)						BINDER				BD 720 (E2)				=		I				
	A						Bearb.		VS												Modell		+								
							Gepr.		MS												Art.-Nr.		Blatt 1								
Zustand		Änderung		Datum		Name		Norm		Urspr.		Ers. f.		Ers. d.		Produktionsstückliste / production parts list						Art.-Nr.		File		von 1 Bl.					
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	

1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
A	Pos. position	BmK. marking		Bezeichnung designation						Typenbezeichnung model number								Teilenummer part number				Bl./Pf. location		A							
	1	-X1		cable connection						964 643 261 - Z 8,5 GK								6002-0004				1.2			1.2						
				net cable 230V AC						H05VV-F3G1,5 - 3x1,5mm² (sw)								5023-0002													
B	2	-1Z1		net filter						KPB 7012/47/4700								5026-0001				1.3		B							
	3	-1H1		signal lamp red						type 9 - Nr. 31310								5008-0003				1.6									
	4	-1F1		thermometer Kl 3.1, 0-120°C						EMF-1/B1								5006-0035				1.8									
C	5	-1B1		Pt 100						TN: 00355341								5002-0008				1.11		C							
	6	-X10		socket 3-pole watertight						ERA.1E.303.CLL								5024-0026				1.11									
	7	-X11		connector 3-pole watertight						FFA.1E.303.CLA.C40								5024-0027				1.11									
D	8	-X20		power socket IP65 - 230VAC/16A						0501-4-2192								5024-0037				1.14		D							
				mains plug IP65						0501-4-2212								5024-0038				1.14									
	9	-2B1		Pt 100						TN: 00355341								5002-0008				2.4									
E	10	-2N1		controller R 3 (100-300°C)						type R3								5014-0052				2.6		E							
	11	-X10		cable interface RS 422						RS 422 for R3								5023-0050				2.7									
				interface RS422 (R3)						TN: 00381008								5014-0055				2.7									
F	12	-2E1		radiator 230V/1250W						KR 55741								5005-0033				2.9		F							
	13	-2E2		radiator 230V/1250W						KR 55741								5005-0033				2.11									
	14	-2K1		solid state relay 25A						D2425								5011-0022				2.11									
G	15	-2R1		varistor						S 20K 275								5018-0001				2.12		G							
	16	-2E3		radiator 230V/2500W						KR 55742								5005-0034				2.13									
H																								H							
I																								I							
J																								J							
K																								K							
L																								L							
M																								M							
N																								N							
O																								O							
P																								P							
Q																								Q							
R																								R							
S																								S							
T																								T							
U																								U							
V																								V							
W																								W							
X																								X							
Y																								Y							
Z																								Z							
AA																								AA							
AB																								AB							
AC																								AC							
AD																								AD							
AE																								AE							
AF																								AF							
AG																								AG							
AH																								AH							
AI																								AI							
AJ																								AJ							
AK																								AK							
AL																								AL							
AM																								AM							
AN																								AN							
AO																								AO							
AP																								AP							
AQ																								AQ							
AR																								AR							
AS																								AS							
AT																								AT							
AU																								AU							
AV																								AV							
AW																								AW							
AX																								AX							
AY																								AY							
AZ																								AZ							
BA																								BA							
BB																								BB							
BC																								BC							
BD																								BD							
BE																								BE							
BF																								BF							
BG																								BG							
BH																								BH							
BI																								BI							
BJ																								BJ							
BK																								BK							
BL																								BL							
BM																								BM							
BN																								BN							
BO																								BO							
BP																								BP							
BQ																								BQ							
BR																								BR							
BS																								BS							
BT																								BT							
BU																								BU							
BV																								BV							
BW																								BW							
BX																								BX							
BY																								BY							
BZ																								BZ							